MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

LIMITS AND DERIVATIVES

Solved Example

1. Evaluate: $\lim\limits_{x \to 2} \dfrac{x^2 - 4}{x - 2}$

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2. Evaluate: $\lim\limits_{x \to 1} \left(\dfrac{2}{x^2 - 1} + \dfrac{1}{1 - x} \right)$

A. $\dfrac{1}{2}$

B. $\dfrac{1}{4}$

C. $-\dfrac{1}{2}$

D. $-\dfrac{1}{4}$

Answer: C

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3. Evaluate: $\displaystyle\lim_{x \to 1} \frac{x - 1}{2x^2 - 7x + 5}$

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4. Evaluate: $\displaystyle\lim_{x \to a} \frac{\sqrt{x} - \sqrt{a}}{x - a}$

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5. Evaluate: $\displaystyle\lim_{x \to 3} \frac{x^2 - 4x + 3}{x^2 + 6x - 27}$

A. $\dfrac{1}{2}$

B. $\dfrac{1}{3}$

C. $\dfrac{1}{6}$

D. 1

Answer: D

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6. Evaluate: $\displaystyle\lim_{x \to 2} \dfrac{x^3 - 2x^2}{x^2 - 5x + 6}$

A. 4

B. -4

C. $-\dfrac{1}{4}$

D. $\dfrac{1}{4}$

Answer: B

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7. Evaluate: $\displaystyle\lim_{x \to 2} \dfrac{x^2 - 4}{x^3 - 4x^2 + 4x}$

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8. Evaluate:

$$\lim_{x \to 1} \left[\frac{x - 2}{x^2 - x} - \frac{1}{x^3 - 3x^2 + 2x} \right]$$

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9. Evaluate : $\displaystyle\lim_{x \to 0} \frac{\sqrt{1 + x} - \sqrt{1 - x}}{x}$

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10. Evaluate $\displaystyle\lim_{x \to 5} \frac{1 - \sqrt{x - 4}}{x - 5}$

A. $-\dfrac{1}{2}$

B. -1

C. -2

D. 0

Answer: A

11. Evaluate: $\displaystyle \lim_{x \to 0} \dfrac{(3+x)^{1/2} - (3-x)^{1/2}}{x}$

12. Evaluate:

$$\lim_{x \to 1} \frac{(2x - 3)(\sqrt{x} - 1)}{2x^2 + x - 3}$$

13. Evaluate: $\lim_{x \to 0} \dfrac{\sin x}{\tan x}$

A. 0

B. 1

C. 2

D. 3

Answer: B

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14. Evaluate: $\lim\limits_{x \to 0} \dfrac{\tan x - \sin x}{x^3}$

A. 1

B. 2

C. $\dfrac{1}{2}$

D. 0

Answer: C

15. Evaluate: $\lim\limits_{x \to \frac{\pi}{4}} \dfrac{\sin x - \cos x}{x - \frac{\pi}{4}}$

A. 2

B. $\sqrt{2}$

C. 0

D. 1

Answer: B

16. Evaluate: $\lim\limits_{x \to \infty} \dfrac{5x^2 + 3x + 1}{3x^2 + 2x + 4}$

17. Evaluate: $= \lim\limits_{z \to 0} m \dfrac{5 + 3x + \ldots + x}{x^2}$

18. The function f(x), for which

$$f(x) = \{x^2, x \neq 12, x = 1\}$$

Show that:

$$\lim_{x \to 1} f(x) = 1$$

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19. Show that $\lim_{x \to 2} \dfrac{[x-2]}{x-2}$ does not exist.

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20. Evaluate: $\displaystyle\lim_{x \to 1} \frac{1 - \sqrt{X}}{\left(\cos^{-1}\sqrt{x}\right)^2}$

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21. Find the derivative of f(x)=5x at x=2.

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22. Find the derivative of $f(x) = 2x^2 + 3x - 4$

at x=0.

A. 1

B. 2

C. 3

D. 4

Answer: C

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23. Find the slope of tangent of the curve $y = 4x$ at the point $(-1, 4)$.

A. -6

B. 6

C. -8

D. 8

Answer: C

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24. Find the derivative of $\cos x$ at x=0.

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25. A particle is moving in a straight line such that the distance covered by it in t seconds from a point is $\left(\dfrac{t^3}{3} - t\right)$ cm. find its speed at t=3 seconds.

26. Find the derivative of $\left(6x^{1/3} + 2e^x\right)$ with respect to 'x'.

A. $2.\ x^{-2/3} + 2.\ e^x$

B. $x^{-2/3} + 2. e^x$

C. $2. x^{2/3} + 2. e^x$

D. $2. x^{-2/3} + e^x$

Answer: A

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27. Find the derivative of $\left(6\log x - \sqrt{x} - 7\right)$ with respect to 'x'

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28. Find the derivative of $\left(5\sqrt{x} + 7\log_e x + \log_a x\right)$ with respect to 'x'

A.

B.

C.

D.

Answer:

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29. Find the derivative of $\left(\dfrac{6}{x^3} + 5\right)$ with respect to 'x' .

30. Differentiate $\left(5x^{1/7} + \dfrac{3}{x^{3/2}}\right)$ with respect to x.

A. $\dfrac{5}{7} \cdot x^{-5/7} - \dfrac{9}{7} x^{-5/2}$

B. $\dfrac{5}{7} \cdot x^{-5/8} - \dfrac{9}{2} x^{-5/2}$

C. $\dfrac{5}{7} \cdot x^{-5/7} - \dfrac{9}{2} x^{-5/2}$

D. $\dfrac{5}{7} \cdot x^{-6/7} - \dfrac{9}{2} x^{-5/2}$

Answer: D

31. Differentiate $(ax)^m + \left(\dfrac{b}{x}\right)^n$ with respect to 'x'.

32. Differentiate $(2\sin x - 3\cos x + 5)$ with respect to 'x'.

33. Differentiate $\left(\tan x - \dfrac{1}{3 \sec x} \right)$ with respect to 'x'.

34. Find the derivative of (4 sec x sin x+cos ec x cos x-5 tan x cot x) with respect to x.

35. Differentiate

$$\left(\sqrt{x} + \frac{1}{x}\right)\left(x - \frac{1}{\sqrt{x}}\right)$$ with respect to 'x'.

36. If $y = \dfrac{1}{3x^3}$ then prove that $3y + x\dfrac{dy}{dx} = 0.$

37. Find the derivative of the function $(x . e^x)$ with respect 'x'.

38. Find the derivative of the function $\sec x . \tan x$ with respect to x.

A. $\cos x (\sec x + \tan x)$

B. $\cos x \left(\sec x + \tan^2 x\right)$

C. $\cos x \left(\sec^2 x + \tan^2 x\right)$

D. $\sec x \left(\sec^2 x + \tan^2 x\right)$

Answer: D

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39. Find the differential coefficient of $\log x^x$ with respect to 'x'.

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40. Find the differential coefficient of

a. $x^2 \sin x$ with respect to 'x' .

41. Find the derivative of $x \sin x$ with respect to x.

A. $(x \cos x - \sin x)$

B. $(3x \cos x + \sin x)$

C. $(x \cos x + \sin x)$

D. $(\cos x + \sin x)$

Answer: C

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42. Find the derivative of $(e^x \sin x)$ with respect to 'x'.

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43. Find the differential coefficient of $(x^2 + 7x + 2)(x + 3)$ with respect to 'x'.

44. Differentiate $\left(e^x \cos x + x^2 \log x\right)$ with respect to 'x'.

A.

B.

C.

D.

Answer:

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45. Find the derivative of $\sin x . \log_e x$ with respect to x.

A.

B.

C.

D.

Answer:

46. Differentiate $\dfrac{2x + 5}{x^2 - 1}$ with respect to 'x'.

47. Differentiate $\dfrac{\log x}{\cos x}$ with respect to 'x'.

48. Differentiate $\dfrac{x^2 - x + 1}{x^2 + x + 1}$ with respect to 'x'.

49. Differentiate $\dfrac{e^x + \cot x}{\tan x - x^n}$ with respect to 'x'.

50. Find the derivative of $\dfrac{\tan x - \cot x}{\tan x + \cot x}$ with respect to 'x'.

51. Fin d the derivative of $\dfrac{\sin x}{x + e^x}$ with respect to 'x'.

52. Differentiate $\dfrac{\sqrt{a} + \sqrt{x}}{\sqrt{a} - \sqrt{x}}$ with respect to 'x'.

53. If $y = \dfrac{\sin x}{1 + \cos x}$ then prove that $\dfrac{dy}{dx} = \dfrac{1}{1 + \cos x}$

54. If $f(x) = \dfrac{x^3}{a^2 - x^2}$ then find the value of $f'\left(\dfrac{a}{2}\right).$

55. Find the differential coefficient of $\dfrac{\sin x - x \cos x}{x \sin x + \cos x}$ with respect to x.

A. $\dfrac{(\sin x - x \cos x)^2}{(x \sin x + \cos x)^2}$

B. $\dfrac{x^2}{(x \sin x + \cos x)^2}$

C. $\dfrac{2x^2}{(x \sin x + \cos x)^2}$

D. $\dfrac{1}{(x \sin x + \cos x)^2}$

Answer: B

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1. $\lim\limits_{x \to 0} \left(x^2 - 3x + 2 \right)$

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2. $\lim\limits_{x \to -1} \dfrac{x^8 + x^4 - 2}{x - 5}$

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3. $\lim\limits_{x \to 4} \dfrac{2x + 3}{x - 2}$

4. $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x - 3}$

5. $\lim\limits_{x \to 2} \dfrac{3x^2 - x - 10}{x^2 - 4}$

6. $\lim\limits_{x \to 3} \left] \dfrac{x^3 - 27}{2x^2 - 5x - 3}\right.$

7. $\lim\limits_{x \to -1} \dfrac{\frac{1}{x} + 1}{x + 1}$

8. $\lim\limits_{x \to 2} \dfrac{x^2 - 5x + 6}{x^2 - 6x + 8}$

9. $\lim\limits_{x \to 3} \dfrac{x^2 + x - 12}{x^2 - 2x - 3}$

10. $\lim\limits_{x \to 2} \dfrac{x^3 - 8}{x^2 - 4}$

11. $\lim\limits_{x \to 0} \dfrac{\sqrt{2 + x} - \sqrt{2}}{x}$

12. $\lim\limits_{x \to 0} \dfrac{2x}{\sqrt{1 + x} - 1}$

13. $\lim\limits_{x \to 0} \dfrac{\sqrt{1 - x^2} - \sqrt{1 + x^2}}{2x^2}$

14. $\lim\limits_{x \to 0} \dfrac{x}{\sqrt{1 + x} - 1}$

15. $\lim\limits_{x \to 2} \dfrac{\sqrt{3 - x} - 1}{2 - x}$

16. $\displaystyle\lim_{x \to 0} \dfrac{\sqrt{a+x} - \sqrt{a-x}}{x}$

17. $\displaystyle\lim_{x \to +1} \dfrac{\sqrt{4+x} - \sqrt{5}}{x-1}$

18. $\displaystyle\lim_{x \to 0} \dfrac{3\sqrt{1+x} - 1}{x}$

19. $\displaystyle\lim_{x \to 0} \dfrac{\sqrt{1 + x + x^2} - 1}{x}$

20. $\displaystyle\lim_{x \to 2} \dfrac{x^2 - 4}{\sqrt{x + 2} - \sqrt{3x - 2}}$

21. $\lim\limits_{x \to 4} \dfrac{3 - \sqrt{5 + x}}{1 - \sqrt{5 - x}}$

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22. $\lim\limits_{x \to 1} \dfrac{x^4 - 3x^2 + 2}{x^3 - 5x^2 + 3x + 1}$

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23. $\lim\limits_{x \to 0} \dfrac{\cos 2x - 1}{\cos x - 1}$

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24. $\lim\limits_{x \to 0} x \sec x$

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25. $\lim\limits_{x \to 0} \dfrac{x^2 - x}{\sin x}$

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26. $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{x^2}$

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27. $\displaystyle\lim_{x \to 0} \frac{\tan 4x}{\tan 2x}$

28. $\displaystyle\lim_{x \to 0} \frac{\sin 3x}{2x}$

29. $\displaystyle\lim_{x \to 0} \frac{\frac{\sin(x)}{4}}{x}$

30. $\lim\limits_{x \to 0} (\cos ecx - \cot x)$

31. Evaluate: $\lim\limits_{x \to \infty} \left(\dfrac{\sqrt{1+x} - \sqrt{1-x}}{\sin^{-1} x} \right)$

32.

$$\lim\limits_{x \to 0} \dfrac{\sin ax + bx}{ax + \sin bx}, a \neq 0, b \neq 0, a + b \neq 0$$

33. $\lim\limits_{x \to 1} \left[\dfrac{x-2}{x^2-x} - \dfrac{1}{x^3 - 3x^2 + 2x} \right]$

34. (i) $\lim\limits_{x \to a} \dfrac{x^m - a^m}{x^n - a^n}$

(ii) $\lim\limits_{x \to a} \dfrac{(1+x)^{1/n} - 1}{x}$

35. $\lim\limits_{x \to \infty} \dfrac{x^3 + 3x^2 + 6x + 5}{x^3 + x + 2}$

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36. $\lim\limits_{x \to \infty} \dfrac{(2x - 3)(3x - 4)}{(4x - 5)(5x - 6)}$

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37. $\lim\limits_{x \to \infty} \dfrac{1^2 + 2^2 + 3^2 + \ldots + x^2}{4x + 3}$

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38. $\displaystyle\lim_{x \to \infty} \frac{2x}{1 + 4x}$

39. $\displaystyle\frac{1^2 + 2^2 + 3^2 + \ldots + x^2}{X^3}$ $\quad x \to \infty$

40. $\displaystyle\lim_{x \to \infty} \frac{\sqrt{3x^2 - 1} - \sqrt{2x^2 - 3}}{4x + 3}$

41. (i) $\lim\limits_{x \to \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1} \right)$

(ii) $\lim\limits_{n \to \infty} \dfrac{n}{2} r^2 \dfrac{\sin(2\pi)}{n}$

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42. $\lim\limits_{x \to \pi} \dfrac{\sin(\pi - x)}{\pi(\pi - x)}$

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43. (i) $\lim\limits_{x \to \pi} \dfrac{\cos ecx - \cot x}{x}$

(ii) $\lim\limits_{x \to 0} \dfrac{\sin x - 2\sin 3x + \sin 5x}{x}$

44. (i) $\displaystyle \lim_{x \to 0} \frac{x \tan 4x}{1 - \cos 4x}$

(ii) $\displaystyle \lim_{y \to 0} \frac{(x + y)\sec(x + y) - x \sec x}{y}$

45. (i) $\displaystyle \lim_{x \to \frac{\pi}{2}} \frac{1 + \cos 2x}{(\pi - 2x)^2}$

(ii) $\displaystyle \lim_{x \to 0} \frac{1 - \cos x . \sqrt{\cos 2x}}{x^2}$

(iii) $\displaystyle \lim_{\theta \to \frac{\pi}{6}} \frac{\sin\left(\theta - \frac{\pi}{6}\right)}{\sqrt{3} - 2 \cos \theta}$

46. If f(x) is defined as follows:

$$f(x) \begin{cases} 1 & x > 0 \\ -1 & x < 0 \\ 0 & x = 0 \end{cases}$$

Then show that $\lim\limits_{x \to 0} f(x)$ does not exist.

47. If f(x) is defined as

$$f(x) \begin{cases} x & 0 \le x < \frac{1}{2} \\ 0 & x = \frac{1}{2} \\ 1 - x & \frac{1}{2} < x \le 1 \end{cases}$$

then evaluate : $\lim\limits_{x \to \frac{1}{2}} f(x)$

48. If f(x) is defined as

$$f(x) = \begin{cases} 2x & + & 3 & x & \leq 0 \\ 3x & + & 3 & x & \leq 0 \end{cases}$$

then evaluate : $\lim\limits_{x \to 0} f(x)$ and $\lim\limits_{x \to 1} f(x)$

49. If $f(x) = \dfrac{|x|}{x}$, then show that $\lim\limits_{x \to 0} f(x)$ does not exist.

50. If $f(x) = \dfrac{|x - a|}{x - a}$, then show that $\lim\limits_{x \to a} f(x)$ does not exist.

51. If f(x) is defined as

$$f(x) = \begin{cases} x & 0 \le x \le 1 \\ 2 & x = 1 \\ 20x & x > 1 \end{cases}$$

then show that $\lim\limits_{X \to 1} f(x) = 1$

52. If $f(x) = \begin{cases} a + bx & x < 1 \\ 4 & x = 1 \\ b - ax & x > 1 \end{cases}$

and $\lim\limits_{x \to 1} f(x) = f(1)$, then find the values of 'a'

and 'b '

Ex 13 B

1. If $f(x) = x^2$ is a real function, find the value of f(1).

2. If $f(x) = x^2 - 4$ then find f'(2).

3. Find the derivative of f(x)=x at x=2.

4. Find the derivative of $\sin x$ at x=0

5. Find the derivative of f(x)=k at x=0 and x=2.

6. Find the slope of tangent of the curve $y = x^2$ at point $\left(\dfrac{1}{3}, \dfrac{1}{9} \right)$

7. Find f(2) and f(3) if $f(x) = x^2 + 2x - 3$.

8.   Find   the   derivative   of

$f(x) = \sin x \, \mathrm{at} x = \dfrac{\pi}{2}$

9. Find the derivative of f(x)=$\tan x$ at x=0.

10. A particle moves in a straight line such that its distance in 't' secodns from a fixed point is $\left(6t - t^2\right)$ cm. find its velocity at the end of t=2 se c.

11. A p article moves in a straight line such that its position in 't' time is $s(t) = \dfrac{t^2 + 3}{t - 1}$ cm. find its velocity at t=4 sec.

Ex 13 C

1. $x^2 + 1$

2. $x^3 + 1 - 1$

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3. $\dfrac{1}{x^2}$

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4. $\dfrac{x + 1}{x - 1}$

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5. Differentiate the following function with respect to x from first principle: $ax^2 + \dfrac{b}{x}$

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6. $\cos x$

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7. $(x + 1)(2x - 3)$

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8. $\sin x + \cos x$

9. $x \cos x$

10. $\tan 2x$

11. $\sin(2x + 3)$

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12. $\tan^2 x$

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Ex 13 D

1. (i) x^4 (ii) x^{-3} (iii) $3x^2$

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2. (i) $6x^{-2}$ (ii) $\dfrac{1}{5}x^5$ (iii) $\dfrac{1}{3x}$

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3. Find the derivative (i) $x^{1/3}$ (ii) $\dfrac{2}{x^{3/2}}$ (iii) $3x^{-1/4}$

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4. $ax^2 + bx + c$

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5. $(ax)^m + (b)^n$

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6. $x^m + a^n$

▶ Watch Video Solution

7. $x^6 + 3x^2 - 5$

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8. $3\sin x + b\cos x$

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9. $\cos x + \dfrac{1}{\sin x}$

▶ Watch Video Solution

10. $\tan x + 3 \cot x - 5 \sec x$

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11. $\dfrac{3}{\tan x} - 2 \cos x$

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12. $\dfrac{2}{\sec x} - \dfrac{3}{\tan x}$

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13. $xe^x \dfrac{-1}{x}$

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14. $\dfrac{x}{2} - \dfrac{2}{x} + \sqrt{x} + \dfrac{3}{\sqrt{x}} + x^2 - 3^x + \dfrac{2}{3}x^6$

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15. $(2x + 3)(3x - 1)$

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16. $x(1 + 2x)^2$

17. $\left(x^2 - \dfrac{1}{x^2} \right)^3$

18. $\dfrac{x^2 + 5x - 3}{x}$

19. $\dfrac{(1+x).3\sqrt{x}}{\sqrt{x}}$

20. $\dfrac{a - b\cos x}{\sin x}$

21. If $y = 6x^5 - 4x^4 + 2x^2 + 3x + 2$, then find $\dfrac{dy}{dx}$ at x=-1.

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22. If $y = 2\sin x + \cot x$, then find $\dfrac{dy}{dx}$ at $x = \dfrac{\pi}{4}$.

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23. If $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$, then show that $2x\dfrac{dy}{dx} + y = 2\sqrt{x}.$

24. If $y = \sqrt{\dfrac{1 - \cos 2x}{1 + \cos 2x}}$, then find $\dfrac{dy}{dx}.$

Ex 13 E

1. Differentiate wrt $x : x^3 \cdot \sec x$

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2. Differentiate wrt $x : \cos x \cdot \cot x$

▶ Watch Video Solution

3. Differentiate wrt $x : \cos ecx \cdot \cot x$

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4. Differentiate wrt $x : x^3 \cdot e^x$

5. Differentiate wrt $x : x^2 \cdot \cos x$.

6. Differentiate wrt $x : \left(x^2 + 2x + 2\right) \cdot \tan x$

7. Differentiate wrt $x : e^x(1 + \log x)$

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8. Differentiate wrt $x : \left(x^2 \sin x - e^x \log x\right)$

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9. Differentiate wrt $x : k \cdot \sin x \cdot \log x$

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10. Differentiate wrt $x : (x^n \cdot e^x + a^x \cdot \tan x)$

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11. Differentiate wrt $x : (3e^x \sin x + a^x \cdot \log x)$

▶ Watch Video Solution

12. Differentiate wrt x :

$\left(a^x \log_e x - \cos x \cdot x^2\right)$

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13. Differentiate wrt $x : (x + \sin x)(x - \cot x)$

14. Differentiate wrt $x : (x^2 + 5x + 1)\cos x$

15. Differentiate wrt x :

$4\sec x \sin x - 5\tan x \cdot \cot x$

16. Differentiate wrt x :

$$\left(\sqrt{x} + \frac{1}{x}\right)\left(x - \frac{1}{\sqrt{x}}\right)$$

17. Differentiate wrt x :

$$(\tan x + \sec x)(\cos ecx + \cot x)$$

18. Differentiate wrt $x : x^2 \cdot e^x \cdot \sin x$

19. Differentiate wrt x :

$$\left(x^2 + 5x + 3\right)\left(2x^2 - 5\right)$$

20. If $y = (x - a)(x - b)$ then find the value of x when $\dfrac{dy}{dx} = 0$.

21. If $y = x \sin x$ then prove that $\dfrac{1}{y}\dfrac{dy}{dx} - \dfrac{1}{x} = \cot x.$

Ex 13 F

1. $\dfrac{x^m}{\log_e x}$

2. $\dfrac{\cos x}{\log_e x}$

3. $\dfrac{x^2 - 1}{x^2 + 7x + 1}$

4. $\dfrac{5x^2 + 6x + 7}{2x^2 + 3x + 4}$

5. $\dfrac{x^2}{e^x + x^2}$

6. $\dfrac{1 - \tan x}{1 + \tan x}$

7. $\dfrac{\tan x}{1 + \tan x}$

8. $\dfrac{1 - \tan x}{\sec x}$

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9. $\dfrac{e^x}{1 + e^x}$

▶ Watch Video Solution

10. $\dfrac{a + b\sin x}{c + d\cos x}$

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11. $\dfrac{\cos ecx + \cot x}{\cos ecx - \cot x}$

12. $\dfrac{x^2 \sin x}{1 - x}$

13. Differentiate wrt x: $\dfrac{\sec x - \tan x}{\sec x + \tan x}$

14. Differentiate the following function with respect of $x\backslash$: $\dfrac{ax^2 + bx + c}{px^2 + qx + r}$

15. Differentiate the following function with respect of x : $\dfrac{\sec x - 1}{\sec x + 1}$

16. Differentiate wrt x : $\dfrac{e^x(x-1)}{x+1}$

17. Differentiate wrt x : $\dfrac{x\tan x}{\sec x + \tan x}$

18. If $y = \dfrac{x}{x+5}$ then prove that $x\dfrac{dy}{dx} = y(1-y)$

19. If $y = \dfrac{e^x}{x}$ then prove that $x\dfrac{dy}{dx} = y(x-1)$

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20. If $f(x) = \dfrac{x-4}{2\sqrt{x}}$, then $f'(4)$ is equal to

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Ex 13 G

1. $\lim\limits_{x \to 0} \dfrac{\sqrt{1+x} - 1}{x} = ?$

A. $\dfrac{1}{2}$

B. 1

C. $\dfrac{3}{2}$

D. 2

Answer:

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2. If $f(x) = \begin{cases} x + 4 & ; x \geq 1 \\ 5x & ; x < 1 \end{cases}$

then $\lim\limits_{x \to 1} f(x) = ?$

A. 3

B. 4

C. 5

D. 6

Answer: C

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3. $\lim\limits_{x \to 0} \dfrac{6^x - 3x^2 - 2^x + 1}{x^2} = ?$

A. $\log3 + \log2$

B. $\log3 . \log2$

C. $\log\dfrac{3}{2}$

D. $\log6$

Answer:

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4. $\displaystyle \lim_{x \to \frac{\pi}{4}} \frac{\sin x - \cos x}{x - \frac{\pi}{4}} = ?$

A. 0

B. 1

C. $\sqrt{2}$

D. None of these

Answer:

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5. $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = ?$

A. 0

B. 2

C. $\dfrac{1}{2}$

D. None of these

Answer: D

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6. $\lim\limits_{x \to 0} \dfrac{2x}{\tan 3x} = $?

A. 3

B. 2

C. $\dfrac{2}{3}$

D. $\dfrac{3}{2}$

Answer: C

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7. $\lim\limits_{x \to 0} \dfrac{\sin^2 4x}{x^2} = ?$

A. 4

B. 8

C. 12

D. 16

Answer:

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8. $\lim\limits_{x \to 0} \dfrac{\sin 4x - \sin 2x + x}{x} = $?

A. 3

B. 4

C. 6

D. 7

Answer: A

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9. $\lim\limits_{x \to 0} \dfrac{\sin 2x + x}{x + \tan 3x} = ?$

A. 1

B. $\dfrac{4}{3}$

C. $\dfrac{3}{4}$

D. $\dfrac{1}{2}$

Answer:

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10. $\displaystyle \lim_{x \to \frac{\pi}{2}} \frac{1 - \sin^3 x}{\cos^2 x} = ?$

A. $\dfrac{2}{3}$

B. $\dfrac{3}{2}$

C. $\dfrac{1}{2}$

D. $\dfrac{1}{x}$

Answer:

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Ex 13 H

1. $\displaystyle\lim_{x \to \infty} \frac{\sin x}{x} = ?$

A. -1

B. 1

C. 0

D. 2

Answer:

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2. $\displaystyle\lim_{x \to 0} \frac{\sqrt{x^2 + 1} - 1}{\sqrt{x^2 + 9} - 3}$?

A. 3

B. -3

C. 2

D. -2

Answer:

3. $\lim\limits_{x \to 0} \dfrac{\sin 4x}{1 - \sqrt{1 - x}} = ?$

A. 6

B. 8

C. 10

D. 12

Answer:

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4. $\lim\limits_{x \to 0} \dfrac{\tan x - x}{x^2 \tan x} = ?$

A. $\dfrac{1}{2}$

B. $\dfrac{1}{3}$

C. $\dfrac{1}{4}$

D. $\dfrac{1}{6}$

Answer:

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5. $\lim\limits_{x \to \infty} \dfrac{\cos x}{x} = \ ?$

A. 0

B. 1

C. -1

D. None of these

Answer: A

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6. If $G(x) = -\sqrt{25 - x^2}$, then $\lim_{x \to 1} \dfrac{G(x) - G(1)}{x - 1} = ?$

A. $-\dfrac{1}{\sqrt{24}}$

B. $-\sqrt{24}$

C. $\sqrt{24}$

D. $\dfrac{1}{\sqrt{24}}$

Answer:

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7. $\lim\limits_{x \to 1} (1 - x)\tan\left(\dfrac{\pi x}{2}\right) = ?$

A. $\dfrac{\pi}{2}$

B. $\dfrac{2}{\pi}$

C. π

D. $\dfrac{1}{\pi}$

Answer:

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8. $\lim\limits_{x \to 0} \dfrac{1 - \cos(1 - \cos x)}{x^4} = ?$

A. $\dfrac{1}{2}$

B. $\dfrac{1}{4}$

C. $\dfrac{1}{8}$

D. $\dfrac{1}{16}$

Answer:

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9.

$$\lim_{r \to \infty} \left(\sqrt{a^2 x^2 + ax + 1} - \sqrt{a^2 x^2 + 1} \right) = ?$$

A. $\dfrac{1}{4}$

B. $\dfrac{1}{2}$

C. 1

D. 2

Answer:

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Ex 13 1

1. $\lim\limits_{x \to 3} x + 3$

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2. $\lim (x \to \pi)\left(x - \dfrac{22}{7}\right)$

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3. $\lim\limits_{r \to 0} \pi r^2$

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4. $\lim\limits_{x \to 4} \dfrac{4x + 3}{x - 2}$

A.

B.

C.

D.

Answer:

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5. $\displaystyle\lim_{x \to -1} \frac{x^{10} + x^5 + 1}{x - 1}$

6. $\displaystyle\lim_{x \to 0} \frac{(x + 1)^5 - 1}{x}$

7. $\displaystyle\lim_{x \to 2} \frac{3x^2 - x - 10}{x^2 - 4}$

8. $\displaystyle \lim_{x \to 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$

9. $\displaystyle \lim_{x \to 0} \frac{ax + b}{cx + 1}$

10. $\displaystyle \lim_{z \to 1} \frac{2^{1/3} - 1}{z^{1/6} - 1}$

11. $\lim\limits_{x \to 1} \dfrac{ax^2 + bx + c}{cx^2 + bx + a}\, a + b + c \neq 0$

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12. $\lim\limits_{x \to -2} \dfrac{\frac{1}{x} + \frac{1}{2}}{x + 2}$

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13. $\lim\limits_{x \to 0} \dfrac{\sin ax}{bx}$

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14. $\displaystyle \lim_{x \to 0} \frac{\sin ax}{\sin bx}$, $a, b \neq 0$

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15. $\displaystyle \lim_{x \to \pi} \frac{\sin(\pi - x)}{\pi(\pi - x)}$

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16. $\displaystyle \lim_{x \to 0} \frac{\cos x}{\pi - x}$

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17. $\displaystyle \lim_{x \to 0} \ \frac{\cos 2x - 1}{\cos x - 1}$

18. $\displaystyle \lim_{x \to 0} \ \frac{ax + x \cos x}{b \sin x}$

19. $\displaystyle \lim_{x \to 0} \ x \sec x$

20. $\lim\limits_{x \to 0} \dfrac{\sin ax + bx}{ax + sinbx}, \; a, b, a + b \neq 0$

21. $\lim\limits_{x \to 0} \left(\operatorname{cosec} \; x - \cot x \right)$

22. $\lim\limits_{x \to \left(\frac{\pi}{2} \right)} \dfrac{\tan 2x}{x - \frac{\pi}{2}}$

23. Find $\lim\limits_{x \to 0} f(x)$ and $f(x)$.

$$f(x) = \begin{cases} 2x + 3 & x \leq 0 \\ 3(x + 1) & x > 0 \end{cases}$$

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24. Find $\lim\limits_{x \to 1} f(x)$, where

$$f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ -x^2 - 1 & x > 1 \end{cases}$$

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25. Evaluate $\lim\limits_{x \to 0} f(x)$, where

$$f(x) = \begin{cases} \dfrac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

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26. Find $\lim\limits_{x \to 0} f(x)$ where

$$f(x) \begin{cases} \dfrac{x}{|x|} & x \neq 0 \\ 0 & x = 0 \end{cases}$$

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27. Find $\lim\limits_{x \to 5} f(x)$, where $f(x) = |x| - 5$.

28. Suppose $f(x) = \begin{cases} a + bx & x < 1 \\ 4 & x = 1 \\ b - ax & x > 1 \end{cases}$

and if $\lim\limits_{x \to 1} f(x) = f(1)$ what are possible

values of a and b ?

29. Let $a_1, a_2, \ldots\ldots, a_n$ be fixed real numbers and define a function $f(x) = (x - a_1)(x - a_2)\ldots\ldots(x - a_n)$, what is lim $f(x)$? For some $a \neq a_1, a_2, \ldots\ldots\ldots a_n$, compute $\lim_{X \to 1}$ f(x)

30. If $f(x) = \begin{cases} |x| + 1 & x < 0 \\ 0 & x = 0 \\ |x| - 1 & x > 0 \end{cases}$

for what value (s) of a does $\lim_{x \to a} f(x)$ exists?

31. If the function f(x) satisfies

$$\lim_{x \to 1} \frac{f(x) - 2}{x^2 - 1} = \pi, \text{ evaluate } \lim_{X \to 1} f(x).$$

32. If $f(x) = \begin{cases} mx^2 + n & x < 0 \\ nx + m & 0 < x \le 1 \\ nx^3 + m & x > 1 \end{cases}$

For what integers m and n does both

$\lim_{x \to 0} f(x)$ and $\lim_{x \to 1} f(x)$ exist?

1. Find the derivative of $x^2 - 2$ at $x = 10$.

  A. 10

  B. 20

  C. 30

  D. 40

Answer: B

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2. Find the derivative of x at x=1,

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3. Find the derivative of 99x at x=100.

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4. Find the derivative of the following functions from first principle.(i) $x^3 - 27$ (ii)

$(x1)(x2)$ (iii) $\dfrac{1}{x^2}$ (iv) $\dfrac{x+1}{x-1}$

5. For the function

$$f(x) = \left(\frac{x^{100}}{100} + \frac{x^{99}}{99} + \ldots + \frac{x^2}{2} \right) + x + 1$$

.

prove that f(1)=100f(0).

6. Find the derivative of

$$x^n + ax^{n-1} + a^2 x^{n-2} + \ldots\ldots\ldots + a^{n-1} x + a^n$$

for some fixed real number a.

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7. For some constants a and b, find the derivative of :

(i) $(x - a)(x - b)$ (ii) $\left(ax^2 + b\right)^2$ (iii) $\dfrac{X - a}{x - b}$

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8. Find the derivative of $\dfrac{x^n - a^n}{x - a}$ for some constant a.

9. Find the derivative of

(i) $2x - \dfrac{3}{4}$ (ii) $\left(5x^3 + 3x - 1\right)(x - 1)$ (iii) $x^{-3}(5 + 3x)$ (iv) $x^5\left(3 - 6x^{-9}\right)$

(v) $x^{-4}\left(3 - 4x^{-5}\right)$ (vi) $\dfrac{2}{x + 1} - \dfrac{x^2}{3x - 1}$

10. Find the derivative of $\cos x$ from first principle.

11. Find the derivative of the following functions:

(i) $\sin x \cos x$ (ii) $\sec x$

(iii) $5 \sec x + 4 \cos x$ (iv) $\cos ecx$

(v) $3 \cot x + 5 \cos ecx$ (vi) $5 \sin x - 6 \cos x + 7$

(vii) $2 \tan x - 7 \sec x$

1. Find the derivative of the following functions from first principles: (i) x (ii) $(-x)^{-1}$ (iii) $s \in (x+1)$ (iv) $\cos\left(x - \dfrac{\pi}{8}\right)$

Find derivative of the following functions (it is to be understood that a, b, c, d, p, q, r and s a

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2. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$(x + a)$

3. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$(px + q)\left(\dfrac{r}{x} + s\right)$$

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4. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$(ax + b)(cx + d)^2$$

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5. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{ax + b}{cx + d}$$

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6. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\frac{1 + \frac{1}{x}}{1 - \frac{1}{x}}$$

7. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{1}{ax^2 + bx + c}$$

8. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{ax + b}{px^2 + qx + r}$$

9. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\frac{px^2 + qx + r}{ax + b}$$

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10. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{a}{x^4} - \frac{b}{x^2} + \cos x$$

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11. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$4\sqrt{x} - 2$

12. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$(ax + b)^n$$

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13. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$(ax + b)^n (cx + d)^m$$

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14. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$\sin(x + a)$

15. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$co \sec x \cot x$

16. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{\cos x}{1 + \sin x}$$

17. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{\sin x + \cos x}{\sin x - \cos x}$$

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18. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\frac{\sec x - 1}{\sec x + 1}$$

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19. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\sin^n x$$

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20. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{a + b \sin x}{c + d \cos x}$$

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21. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\frac{\sin(x + a)}{\cos x}$$

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22. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$x^4(5 \sin x - 3 \cos x)$$

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23. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\left(x^2 + 1\right)\cos x$$

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24. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\left(ax^2 + \sin x\right)\left(p + q \cos x\right)$$

25. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\left(x + \cos x\right)\left(x - \tan x\right)$$

26. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{4x + 5\sin x}{3x + 7\cos x}$$

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27. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\frac{x^2 \cos\left(\frac{\pi}{4}\right)}{\sin x}$$

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28. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$$\frac{x}{1 + \tan x}$$

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29. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants and m and n are integers):

$(x + \sec x)(x - \tan x)$

30. Find the derivative of the following functions (it is to be understand that a,b,c,d,p,q,r and s are fixed non-zero constants

and m and n are integers):

$$\frac{x}{\sin^n x}$$