MATHS

BOOKS - CENGAGE

GRAPHS OF POLYNOMIAL AND RATIONAL FUNCTIONS

Illustrations

1. Draw the rough sketch of the curve $y = (x-1)^2(x-3)^3$

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2. Draw the rough sketch of the curve $y = (x-1)^2(x-2)(x-3)^3$.

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3. Draw the rough sketch of the curve $y = x^4 - x^2$.

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4. Draw the graph of the function $y = 3x^4 - 4x^3$. Discuss the points of local extremum, inflection and intervals of monotonicity.

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5. Draw the graph of $|y| = (x-1)(x-2)(x-3)$.

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6. If $f(x) = 3\sqrt{1-x^2} + 3\sqrt{1-x^2}$, $then f(x)$ is

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7. Whether the given equation $\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} = \cot\theta - \csc\theta$?

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8. Draw the graph of $y = x^4 + 2x^2 - 8x + 3$

Find the number of real roots of the equation $x^4 + 2x^2 - 8x + 3 = 0$.

Also find the sum of the integral parts of all real roots.

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9. Let a $\in$ R and f : $R \to R$ be given by $f(x) = x^5 - 5x + a$, then

(a) $f(x) = 0$ has three real roots if $a > 4$

(b) $f(x) = 0$ has only one real root if $a > 4$

(c) $f(x) = 0$ has three real roots if $a < -4$

(d) $f(x) = 0$ has three real roots if $-4 < a < 4$

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10. If cosθ= 3/5 then the value of (sinθ−tanθ+1)/2tan^2θ

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11. Find the area bounded by the curves $y = \sqrt{1 - x^2}$ and $y = x^3 - x$ without using integration.

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12. Draw the graph of $f(x) = 4x^3 - 3x$ and hence draw the graph of $g(x) = \cos^{-1}(4x^3 - 3x)$.

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13. Let $f(x) = x^3 - 3x^2 + 6 \forall x \in R$ and $g(x) = \{max : f(t; x + 1 \leq t \leq x + 2, -3 \leq x \leq 01 - x, x \geq$ .Find continuity and differentiability of g(x) for x in [-3,1]

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14. Find the value of k if $x^3 = 3x + a = 0$ has three real distinct roots.

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15. If t is a real number satisfying the equation $2t^3 - 9t^2 + 30 - a = 0$, then find the values of the parameter a for which the equation $x + \frac{1}{x} = t$ gives six real and distinct values of x .

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16. Let $f(x) = x^3 - 9x^2 + 24x + c = 0$ have three real and distinct roots α, β and λ.

(i) Find the possible values of c.

(ii) If $[\alpha] + [\beta] + [\lambda] = 8$, then find the values of c, where $[\cdot]$ represents the greatest integer function.

(ii) If $[\alpha]+[\beta]+[\lambda]=7$, then find the values of c, where $[\cdot]$ represents the greatest integer function.s

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17. Draw the graph of $f(x)=\frac{x^2-5x+6}{x^2-x}$

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18. Draw the graph of $y=\frac{1}{x^2}$.

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19. Write a possible rational function h with a hole at $x=5$, a vertical asymptote at $x=-1$, a horizontal asymptote at $y=2$ and x-intercept at $x=2$.

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20. Write a rational function g with vertical asymptotes at $x = 3$ and $x = -3$, a horizontal asymptote at $y = -4$ and with no x-intercept.

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21. Draw the graph of $y = f(x) = \frac{x+1}{x^2+1}$

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22. Draw the graph of the function $f: R - \{-1, 1\} \to R.\ f(x) = \frac{x}{1-|x|}$.

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23. Draw the graph of $f(x) = \frac{1}{x^2 - 2x + 2}$.

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24. From the graph of $y = x^2 - 4$, draw the graph of $y = \frac{1}{x^2 - 4}$.

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25. Draw the graph of $y = x^2 + \frac{1}{x^2}, x \neq 0$.

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26. Draw the graph of $f(x) = \left| \frac{x^2 - 2}{x^2 - 1} \right|$.

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27. Draw the graph of $y = \frac{1 - x^2}{1 + x^2}$ and hence draw the graph of $y = \cos^{-1}.\frac{1 - x^2}{1 + x^2}$.

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28. Write a possible rational function h with a hole at x = 5, a vertical asymptote at x = -1, a horizontal asymptote at y = 2 and x-intercept at x = 2.

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29. Draw the graph of $y = \frac{x-1}{x-2}$.

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30. Draw the graph of $y = \frac{3x - x^3}{1 - 3x^2}$ and hence the graph of $y = \tan^{-1}.\frac{3x - x^3}{1 - 3x^2}$.

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31. Draw the graph of $y = \frac{x^3}{3(x+1)}$.

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32. Draw the graph of $y = \frac{1}{x+1} + \frac{1}{x} + \frac{1}{x-2}$.

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33. Find the greatest value of $f(x)\frac{1}{2ax - x^2 - 5a^2} \in [-3, 5]$ depending upon the parameter a.

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Exercise

1. Draw the graph of $y = (x-1)\left(x^2 - x + 1\right)$.

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2. Draw the graph of $y = \left(x^2 - x^5\right)(x-2)^3$.

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3. Draw the graphs of

(i) $y = x^2(x-1)|x-2|$

(ii) $y = x^3(x-1)|x-2|$

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4. Write a possible rational function f that has a vertical asymptote at x = 2, a horizontal asymptote y = 3 and a zero at x = -5. Also draw the graph of the function.

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5. Draw the graph of $y = f(x) = \frac{x^2}{x^2+1}$.

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6. Draw graph of $y = \dfrac{x^2 - 6x + 4}{x^2 + 2x + 4}$.

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7. Draw the graph of $f(x) = \dfrac{x^2 - 8x + 15}{x^2 - 2x}$.

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8. Draw the graph of $y = f(x) = \dfrac{x^2}{x^2 + 1}$.

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9. Draw the graph of $y = x + \dfrac{1}{x}$

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10. Draw graph of $y = \dfrac{1}{x^2} - x$.

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11. Draw graph of $y = \frac{x^3 - 2x^2}{3(x+1)^2}$.

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12. Draw graph of $y = \frac{x^3 - 2x^2}{3(x+1)^2}$.

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13. If $x = a\cos^3\theta$ and $y = a\sin^3\theta then \frac{dy}{dx} =$

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Exercises

1. Sketch the graph of an example of a rational function f that satisfies all the given conditions.

(i) $f(0) = 0, f(1), \lim_{x \to \infty} f(x) = 0, f$ is odd

(ii)

$\lim_{x \to 0^+} f(x) = \infty, \lim_{x \to 0^-} f(x) = -\infty, \lim_{x \to \infty} f(x) = 1, \lim_{x \to -\infty} f(x) =$

(iii) $\lim_{x \to -2} f(x) = \infty, \lim_{x \to -\infty} f(x) = 3, \lim_{x \to \infty} f(x) = 3, f(0) = 0$

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2. Draw the graph of $y = f(x) = \dfrac{x+1}{x^2+1}$

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3. Draw the graph of $y = \dfrac{1}{x+1} + \dfrac{1}{x} + \dfrac{1}{x-2}$.

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4. Draw the graph of $y = |x| + 2$

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