MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

DIFFERENTIALS, ERRORS AND APPROXIMATIONS

Illustration

1. If $y = x^4 - 10$ and if x changes from 2 to 1.99, what is the approximate change in y? Also, find the changed value of y.

    A. 0.32

    B. -0.32

    C. 5.68

    D. 6.32

Answer: B

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2. A circular metal plate expands under heating so that its radius increases by 2%. Find the approximate increase in the area of the plate if the radius of the plate before heating is 10cm.

    A. 2π

    B. 3π

    C. π

    D. 4π

Answer: D

3. If in a triangle ABC, the side c and the angle C remain constant, while the remaining elements are changed slightly, show that $$\frac{da}{\cos A} + \frac{db}{\cos B} = 0.$$

A. 0

B. 1

C. -1

D. none of these

Answer: A

4. If a triangle ABC, inscribed in a fixed circle, be slightly varied in such away as to have its vertices always on the circle, then show that $\frac{da}{cas\,A} + \frac{db}{\cos B} + \frac{dc}{\cos C} = 0.$

A. 0

B. 1

C. -1

D. none of these

Answer: A

5. Find the percentage error in calculating the volume of a cubical box if an error if 1% is made in measuring the length of edges of the cube.

A. 1%

B. 2%

C. 3%

D. $3/2\%$

Answer: C

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6. Use differentials to approximate $\sqrt{25.\,2}$

A. 5.01

B. 5.02

C. 5.03

D. none of these

Answer: B

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Section I Solved Mcqs

1. If the percentage error in the edge of a cube is 1, then error in its volume, is

A. 0.01

B. 2 %

C. 3 %

D. none of these

Answer: C

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2. If the percentage error in the radius of a sphere is a , find the percentage error in its volume.

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

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

C. $3a\ \%$

D. none of these

Answer: c

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3. In a $\triangle$ ABC if sides a and b remain constant

such that a is the error in C, thenrelativy error

in its area, is

A. $a \cot C$

B. a sin C

C. a tan C

D. a cos C

Answer: A

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4. The approximate value of $(1.0002)^{3000}$, is

A. 1.2

B. 1.4

C. 1.6

D. 1.8

Answer: C

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5. The focal length of a mirror is given by $\dfrac{1}{v} - \dfrac{1}{u} = \dfrac{2}{f}$. If equal errors α are made inmeasuring u and v. Then relative error in f is

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

B. a(1/u+1/v)`

C. $a\left(\dfrac{1}{u} - \dfrac{1}{v}\right)$

D. none of these

Answer: B

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6. In a triangle ABC, the sides b, c are given. If there is an error δA in measuring angle A.Then side a is error δa in the side a is

A. $\dfrac{S}{2a}\Delta A$

B. $\dfrac{2S}{2a}\Delta A$

C. $bc\sin A\Delta A$

D. none of these

Answer: B

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7. The value of $(127)^{1/3}$ to four decimal places, is

A. 5.0267

B. 5.4267

C. 5.5267

D. 5.001

Answer: A

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8. If $T = 2\pi\sqrt{\dfrac{1}{8}}$, then relative errors in T and

l are in the ratio

A. $1/2$

B. 2

C. $1/2\pi$

D. none of these

Answer: A

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9. If errors of 1% each are made in te base radius and height of a cylinder, then the percentage error in its volume, is

A. 1 %

B. 2 %

C. 3 %

D. none f these

Answer: C

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10. If an error of $1°$ is made in measuring the

angle of of a sector of radius 30 cm, then the

approximate eror in its area, is

A. $450 cm^2$

B. $25\pi cm^2$

C. $2.5\pi cm^2$

D. none of these

Answer: C

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11. The semi-vertical angle of a cone is $45°$. If the height of the cone is 20.025, then its approximate laternal surface area, is

A. $401\sqrt{2}\pi$

B. $400\sqrt{2}\pi$

C. $399\sqrt{2}\pi$

D. none of these

Answer: A

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12. A point on the parabola $y^2 = 18x$ at which

the ordinate increases at twice the rate of the

abscissa is (a) (2,6) (b) $\left(2, -6\right)$ $\left(\dfrac{9}{8}, -\dfrac{9}{2}\right)$

(d) $\left(\dfrac{9}{8}, \dfrac{9}{2}\right)$

A. $(9/8, 9/2)$

B. (2,-4)

C. $(-9/8, 9/2)$

D. (2,4)

Answer: A

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13. The period of oscillation T of a pendulum of length l at a place of acceleleration due to gravity g is given by $T = 2\pi\sqrt{\dfrac{l}{g}}$. If the calculated length is 0.992 times the actual length and if the value assumed for g is 1.002times its actal value, the relative error in the computed value of T, is

A. 0.005

B. -0.005

C. 0.003

D. -0.003

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14. The area of a triangleis computed using the formula $S = \dfrac{1}{2}bc\sin A$. If the relative errors made in measuring b,c and calculating S are respectively 0.02,0.01 and 0.13 the approximate error in A when $A = \pi/6$, is

A. 0.05 radians

B. 0.01 radians

C. 0.05 degree

D. 0.01 degree

Answer: A

15. The circumference of a circle is measured

as 56 cm with an error 0.02 cm. The

percentage error in its area, is

A. $\dfrac{1}{7}$

B. $\dfrac{1}{28}$

C. $\dfrac{1}{14}$

D. $\dfrac{1}{56}$

Answer: C

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Exercise

1. If there is an error of 2% in measuring the length of simple pendulum, then percentage error in its period is: 1% (b) 2% (c) 3% (d) 4%

A. 1%

B. 2%

C. 3%

D. 4%

Answer: A

2. If there is an error of a% in measuring the edge of a cube, then percentage error in its surface is 2a% (b) $\dfrac{a}{2}$ % (c) $3a$ % (d) none of these

    A. $2a$ %

    B. $\dfrac{a}{2}$ %

    C. 3 %

    D. none of these

Answer: A

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3. If an error of $k\%$ is made in measuring the radius of a sphere, then percentage error in its volume. k% (b) 3k% (c) 3k% (d) $\dfrac{k}{3}\%$

A. $K\%$

B. $3k\%$

C. $2k\%$

D. $k/3\%$

Answer: B

4. The height of a cylinder is equal to the radius. If an error of $\alpha\%$ is made in the height, then percentage error in its volume is $\alpha\%$ (b) $2\alpha\%$ (c) $3\alpha\%$ (d) none of these

A. $a\%$

B. $2a\%$

C. $3a\%$

D. none of these

Answer: C

5. While measuring the side of an equilateral triangle an error of $k\%$ is made, the percentage error in its area is k% (b) 2k% (c) $\frac{k}{2}\%$ (d) 3k%

A. $K\%$

B. $2k\%$

C. $\frac{k}{2}\%$

D. $3k \, \%$

Answer: B

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6. Use differentials to find the approximate value of $(\log)_e(4.01)$, having given that $(\log)_e 4 = 1.3863$.

A. 1.3968`

B. 1.3898

C. 1.3893

D. none of these

Answer: C

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7. A sphere of radius 100man shrinks to radius 98mm, then the approximate decrease in its volume is $12000\pi mm^3$ (b) $800 \ \pi mm^3$ $8000\pi mm^3$ (d) $120\pi mm^3$

A. $12000\pi mm^3$

B. $800\pi mm^3$

C. $80000\pi mm^3$

D. $120\pi mm^3$

Answer: C

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8. If the ratio of base radius and height of a cone is 1:2 and percentage error in radius is

$\lambda \%$, then the error in its volume is $\lambda \%$ (2) 2 $\lambda \%$ (c) 3 $\lambda \%$ (d) none of these

A. $\delta \%$

B. $2\delta \%$

C. $3\delta \%$

D. none of these

Answer: C

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9. The pressure P and volume V of a gas are connected by the relation $PV^{\frac{1}{4}} =$ constant. The percentage increase in the pressure corresponding to a deminition of % in the volume is $\dfrac{1}{2}$ % (b) $\dfrac{1}{4}$ % (c) $\dfrac{1}{8}$ % (d) none of these

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

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

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

D. none of these

Answer: C

10. If $y = x^n$, then the ratio of relative errors

in $y and x$ is 1:1 (b) 2:1 (c) 1:n (d) n:1

   A. $1:1$

   B. $2:1$

   C. $1:n$

   D. $n:1$

Answer: D

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11. The approximate volume of $(33)^{\frac{1}{5}}$ is 2.0125

(b) 2.1 (c) 2.01 (d) none of these

    A. 2.0125

    B. 2.1

    C. 2.01

    D. none of these

Answer: A

12. The circumference of a circle is measured as 28cm with an error of 0.01cm. The percentage error in the area is $\frac{1}{14}$ (b) 0.01 (c) $\frac{1}{7}$ (d) none of these

A. $\frac{1}{14}$

B. 0.01

C. $\frac{1}{7}$

D. none of these

Answer: A

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13. If angles A,B,C o $\triangle ABC$ asre cute show that $\cos^2 A + \cos^2 B + \cos^2 C < 1$

A. 2R

B. π

C. 0

D. none of these

Answer: C

14. If there is an error of 0.01 cm in the diameter of a sphere, then percentage error in surface area when the radius =5 cm, is

A. $0.005\ \%$

B. $0.05\ \%$

C. 0.1 %

D. 0.2 %

Answer: d

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15. If $1° = 0.017$ radians, then the approximate value of $\sin 46°$, is

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

B. $\dfrac{0.017}{\sqrt{2}}$

C. $\dfrac{1.017}{\sqrt{2}}$

D. none of these

Answer: C

16. Using differentials, find the approximate value of $\sqrt{401}$

A. 20.100

B. 20.025

C. 20.030

D. 20.125

Answer: B

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17. Using differentials, the approximate value if $(627)^{1/4}$, is

A. 5.002

B. 5.003

C. 5.005

D. 5.004

Answer: D

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