# d'doubtnut 

India's Number 1 Education App

## MATHS

## AIMED AT STUDENTS PREPARING FOR

## IIT JEE EXAMINATION

## RATE MEASUREMENT

## Lecture Sheet Excrcise 1 Straight Objective Type

 Questions1. If $S=2 t^{2}-3 t^{2}+15 t-8$, then the initial velocity is
A. 8
B. 10
C. 15
D. 36

Answer: C
( Watch Video Solution
2. A particle moves along $a$ line by $s=\frac{1}{3} t^{2}+8 t+5$, it changes its direction when
A. $t=1, t=2$
B. $t=2, t=4$
C. $t=0, t=4$
D. $t=2, t=3$

Answer: B
3. A particle moves along $a$ line by
$s=t^{3}-9 t^{2}+24 t$. Then S is decreasing when
$\mathrm{t} \in$
A. $(2,4)$
B. $(-\infty, 2) \cup(4, \infty)$
C. $(-\infty, 2)$
D. $(4, \infty)$

Answer: A

D Watch Video Solution
4. A particle ' $p$ ' moves along a straight line away from a point ' O ' obeying the relation $\mathrm{S}=$ $16+48 t-t^{3}$. The direction of ' $P$ ' after $t=4$ is
A. is towards ' O '
B. is away from 'O'
C. is at rest
D. is at ' O '

Answer: A

D Watch Video Solution
5. A stone is thrown vertically up and the height $s$ reached in time $t$ is given by $s=80 t-16 t^{2}$. The stone reaches the maximum height in time $t=$
A. 2 sec
B. 2.5 sec
C. 3 sec
D. 3.5 sec

Answer: B
6. An angle is increasing at a constant rate.

The rate of increase of tan when the angle is
$\pi / 3$ is
A. 4 C
B. 6 C
C. 8 C
D. 2 C

Answer: A
7. The point pis moving with uniform velocity $v$ along a straight line $A B . O$ isa point on a perpendicular to $A B$ at $A$ and distance $l$ from
it. The angular velocity of pabout $O$ is
A. $\frac{l v}{o p}$
B. $\frac{l v}{o p^{2}}$
C. $\frac{l v^{2}}{o p}$
D. $\frac{o p^{2}}{l v}$

Answer: B

## D Watch Video Solution

8. The motion of a particle along straight line
is given by $v^{2}=u^{2}+90 s$. If the particle starts
from rest, then the acceleration is
A. 15 unit/ $\mathrm{sec}^{2}$
B. 30units/sec ${ }^{2}$
C. 45 units/ $\mathrm{sec}^{2}$
D. 75 units $/ \mathrm{sec}^{2}$

## Answer: C

## - Watch Video Solution

9. A particle moves along a straight line and its
velocity at a distance ' $x$ ' from the origin is
$k \sqrt{a^{2}-x^{2}}$. Then accelertion of the particle is
A. $k$
B. $-k^{2}$
C. kx
D. $-k^{2} x$

## Answer: D

## D Watch Video Solution

10. The position of a point in time ' $t$ ' is given
by $\mathrm{x}=1+2 \mathrm{t}+3 t^{2}$ and $y=2-3 t+4 t^{2}$. Then
its acceleration at time ' t ' is
A. 10
B. 12
C. 13
D. 15

Answer: A

## D Watch Video Solution

11. A particle is moving on a straight line so
that its distance $s$ from a fixed point at any
time t is proportional to $t^{n}$. If v be the velocity
and 'a' the acceleration at any time , then
$\frac{n a s}{n-1}$ equals
A. v
B. $v^{2}$
C. $v^{3}$
D. 2 v

Answer: B

## D Watch Video Solution

12. The area of an equilateral triangle of side 'a'
feet is increasing at the rate of $4 \mathrm{sq} . \mathrm{ft} / \mathrm{sec}$. The
rate at which the perimeter is increasing is
A. $\frac{3 \sqrt{8}}{2}$

> B. $\frac{8 \sqrt{3}}{a}$
> C. $\frac{\sqrt{3}}{a}$
> D. $\frac{2 \sqrt{3}}{a}$

Answer: B

## D Watch Video Solution

13. A variable triangle is inscribed in a circle of radius $R$. If the rate of change of a side is $R$ times the rate of change of he opposite angle, then the opposite angle is
A. $\frac{\pi}{6}$
B. $\frac{\pi}{4}$
C. $\frac{\pi}{3}$
D. $\frac{\pi}{2}$

Answer: C

## - Watch Video Solution

14. At a given instant, the sides $O A$ and $O B$ of a right angled triangled $A O B$ are 8 cm and 6 cms respectively If OA increases at the rate of
$2 \mathrm{~cm} / \mathrm{sec}$ and $O B$ decreases at the rate of 1 $\mathrm{cm} / \mathrm{sec}$, the rate of decreases of the area of
$\Delta A O B$ after 2 seconds is
A. $2 \mathrm{sq} \mathrm{cm} / \mathrm{sec}$
B. $1 \mathrm{sq} \mathrm{cm} / \mathrm{sec}$
C. $3 \mathrm{sq} \mathrm{cm} / \mathrm{sec}$
D. $4 \mathrm{sq} \mathrm{cm} / \mathrm{sec}$

Answer: A

D Watch Video Solution
15. $A$ ladder $A B$ of 10 mts long moves with its ends $o$ the axes. When the end $A$ is 6 mts form
the origin. It moves away from it at
$2 \mathrm{mts} / \mathrm{minute}$. The rate of increase of the area of the $\Delta O A B$ is

$$
\begin{aligned}
& \text { A. } \frac{4}{3} \\
& \text { B. } \frac{8}{3} \\
& \text { C. } \frac{14}{3} \\
& \text { D. } \frac{7}{2}
\end{aligned}
$$

## - Watch Video Solution

16. A kite flying at a height ' $h$ ' mts has " $x$ " meters of string paid out at a seconds. If the kite moves horizontally with constant $v$ $\mathrm{mts} / \mathrm{sec}$. Then the rate at which the string is paid out is

$$
\begin{aligned}
& \text { A. } \frac{\sqrt{x^{2}-h^{2}}}{v} m t / \mathrm{sec} \\
& \text { B. } \sqrt{x^{2}-h^{2}} m t / \mathrm{sec} \\
& \text { C. } \frac{v \sqrt{x^{2}-h^{2}}}{x} m t / \mathrm{sec} \\
& \text { D. } \frac{\sqrt{x^{2}-h^{2}}}{h} m t / \mathrm{sec}
\end{aligned}
$$

## Answer: C

## D Watch Video Solution

17. A person of height 180 cm starts from a lamp post height 450 cm and walks at the constant rate of 4 km per hour. Find the rate at which his shadow increases.
A. 2 kmph
B. 6.4 kmph
C. $8 / 3 \mathrm{kmph}$

## D. 4 kmph

## Answer: C

## - Watch Video Solution

18. Two ships $A$ and $B$ are sailing away from a point O along routes such that $\angle A O B$ is always $120^{\circ}$. At a certain instance, $\mathrm{OA}=8 \mathrm{KM}$
$O B=6 \mathrm{~km}$ and the ship $A$ is sailing at the rate of $20 \mathrm{~km} / \mathrm{hr}$ while the ship B sailing at the rate of $30 \mathrm{~km} / \mathrm{hr}$ while the ship $B$ sailing at the rate
of $30 \mathrm{~km} / \mathrm{hr}$. Then the distance between A and $B$ is changing at the rate (in $\mathrm{km} / \mathrm{hr}$ )

$$
\begin{aligned}
& \text { A. } \frac{260}{\sqrt{37}} \\
& \text { B. } \frac{260}{37} \\
& \text { C. } \frac{80}{\sqrt{37}} \\
& \text { D. } \frac{80}{37}
\end{aligned}
$$

Answer: A
19. The two equal sides of an isoceles triangle
with fixed base $b$ are decreasing at the rate of
$3 \mathrm{~cm} / \mathrm{s}$. How fast is the tea decreasing when the two equal to the base?
A. $\sqrt{3} b c m^{2} / s$
B. $\sqrt{3} b c m^{2} / s$
C. $\sqrt{\frac{3}{2}} \mathrm{~cm}^{2} / \mathrm{s}$
D. $\sqrt{3} b^{2} \mathrm{~cm}^{2} / \mathrm{s}$

Answer: A
20. Let $x$ be the length of one of the equal sides of an isosceles triangle, and let $\theta$ be the angle between them. If $x$ is increasing at the rate $(1 / 12) \mathrm{m} / \mathrm{h} /$ and $\theta$ is increasing at the rate of $\pi / 180$ radians $/ h$ then the rate in $m^{2} / h$ at which the area of the triangle whe $x=12 m$ and

$$
\theta=\pi / 4
$$

$$
\begin{aligned}
& \text { А. } \sqrt{3}\left(\frac{\pi}{5}+\frac{1}{2}\right) \\
& \text { В. } \sqrt{2}\left(\frac{\pi}{5}+\frac{1}{2}\right)
\end{aligned}
$$

C. $\left(\frac{\pi}{5}+\frac{1}{2}\right)$
D. $\sqrt{2}\left(\frac{\pi}{5}+\frac{1}{5}\right)$

Answer: B

## D Watch Video Solution

21. The rate of change of area of a square plate
is equal to that of the rate of change of its
perimeter. Then length of the side is
A. 2 units
B. 3 units
C. 4 units
D. 6 units

## Answer: A

## - Watch Video Solution

22. Two parallel sides of a rectangle are being
lenghtened at the rate of $2 \mathrm{~cm} / \mathrm{sec}$ while the
other two sides are shortened in such a way
the area of the rectangle is $50 \mathrm{sq} . \mathrm{cm}$ The rate
of change of the perimeter when the length of an increasing side 5 cm is
A. $2 \mathrm{~cm} / \mathrm{sec}$
B. $6 \mathrm{~cm} / \mathrm{sec}$
C. $-2 c \frac{m}{\mathrm{sec}}$
D. $-4 c \frac{m}{\mathrm{sec}}$

Answer: D
( Watch Video Solution
23. A point on the parabola $y^{2}=18 x$ at which
the ordinate increases at twice the rate of the abscissa is
A. $(2,4)$
B. $(9 / 8,9 / 2)$
C. $(-9 / 8,9 / 2)$
D. $(2,-4$

Answer: B

D Watch Video Solution
24. Two cars started from a plane one moving due east and the other due north with equal
speed $V$. Then the rate at which they were being seperated from each other is

> A. $\frac{\sqrt{2}}{V}$
> B. $\frac{V}{\sqrt{2}}$
> C. $\frac{1}{\sqrt{2} V}$
> D. $\frac{1}{\sqrt{2} V}$

## Answer: D

25. If a metallic circular plate of radius 50 cm is
heated $s$ that its radius increases at the rate of 1 mm per hour, then the rate at which, the area of the plate increases (incm ${ }^{2} /$ hour) is
A. $5 \pi$
B. $10 \pi$
C. $100 \pi$
D. $50 \pi$

## Answer: C

## D Watch Video Solution

26. A stone is dropped into a quiet pond and waves move in circles outward from the place where it strikes, at a speed of 30 cm per second. At the instant when the radius of the wave ring is 50 m , the rate of increases in the area of the wave ring is
A. $0.75 \pi$ sq. $\mathrm{cm} / \mathrm{sec}$
B. $30 \mathrm{sq} . \mathrm{cm} / \mathrm{sec}$
C. $30 \pi$ sq.m $/ \mathrm{sec}$
D. $0.4 \pi \mathrm{sq} . \mathrm{cm} / \mathrm{sec}$

## Answer: C

## D Watch Video Solution

27. $A$ is a fixed point on the circumference of a circle with centre ' $O$ ' and radius ' $r$ ', A particle starts at $A$ and moves on the circumference
with an 4 radian $/ \mathrm{sec}$. If $P M$ is perpendicualar
to OA and $a l g \leq P O M=\pi / 3$, then the rate at which of $\triangle P O M$ decreases is
A. $\frac{r^{2}}{2} \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$
B. $r \mathrm{cms} / \mathrm{sec}$
C. $\frac{3 r^{2}}{2} \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$
D. $2 r^{2} \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$

Answer: B

D View Text Solution

## 28. If $k$ is the diameter of a circle and $A$ is the

 area of a sector of the circle whose vertical angle is $\theta$ then $\frac{d A}{d t}=$A. $\frac{k^{2}}{8}\left(\frac{d \theta}{d t}\right)$
B. $\left(\frac{k^{2}}{4}\right)\left(\frac{d \theta}{d t}\right)$
C. $\frac{d \theta}{d t}$
D. $k\left(\frac{d \theta}{d t}\right)$

Answer: A
29. A point $p$ moves with an angular velocity 2
radians/sec on the circumference of a circle with cente O and radius 2 cms . PM is perpendicular to the diameter of the circle such that $\angle P O M=\theta$. If the velocity of the point $M$ is zero, then values of $\theta$ are
A. $0, \pi$
B. $\frac{\pi}{2}, \pi$
C. $\frac{\pi}{3}, \frac{\pi}{6}$
D. $\frac{\pi}{4}, \frac{3 \pi}{4}$

Answer: A

## D View Text Solution

30. The side of a cube is equal to the radius of
a shpere. If the side and the radius increase at
the same rate, then the relation between the rates of change of surface areas of the cube and sphere respectively is
A. $<$
B. $>$
C. $=$
D. $\geq$

## Answer: A

## - Watch Video Solution

31. The volume of metallic hallow sphere is
constant. If the order radius is increasint at
thed rate of $\mathrm{V} \mathrm{cm} / \mathrm{sec}$. Then the rate at which
the inner radius increasing when the radii are
$a+d, a$ is

$$
\begin{aligned}
& \text { A. } \frac{V(a+d)^{2}}{a^{2}} \\
& \text { B. } \frac{V(a+d)}{a} \\
& \text { C. } V(a+d) \\
& \text { D. } a+d
\end{aligned}
$$

## Answer: A

## D Watch Video Solution

32. If the surface area of a sphere of radius $r$ is
increasing uniformly at the rate $\mathrm{cm}^{2} / s$, then the rate of change of its volume is :
A. costant
B. proportional to $\sqrt{r}$
C. proportional to $r^{2}$
D. proportional to $r$

## Answer: D

## D Watch Video Solution

33. A spherical ballon is being inflated at the rate of $35 \mathrm{cc} / \mathrm{min}$. The rate of increases in the
surface area (incm ${ }^{2} \mathrm{~min}$ ) of the ballon when
its diameter is 14 cm , is :
A. 10
B. $\sqrt{10}$
C. 100
D. $10 \sqrt{10}$

Answer: A
( Watch Video Solution
34. A spherical ballon is filled with $4500 \pi$ cubic meters of helium gas. If a leak in the ballon cause the gas to escape at the ratio of $72 \pi$ cubic meters per meters, then the rate (in meters per minute) at which the radius of the ballon decreases 49 minutes after the leakage bagan is
A. $2 / 9$
B. $9 / 2$
C. $9 / 7$

## D. $7 / 9$

## Answer: A

## D Watch Video Solution

35. If the volume of a spherical ball is increasing at the rate of $4 \pi \mathrm{cc} / \mathrm{sec}$, then the rate of increases of its radius (in $\mathrm{cm} / \mathrm{sec}$ ), when the volume is $288 \pi$ cc.
A. $\frac{1}{6}$
B. $\frac{1}{9}$
C. $\frac{1}{36}$
D. $\frac{1}{24}$

## Answer: C

## D Watch Video Solution

36. A conical vesel of height 10 mts and radius

5 units.is being filled water at uniform rate of
$3 / 2$ cu.mts/min. The rate at which the level of
water rises when the depth of water in the vessle is 4 mts is
A. $3 \pi \mathrm{mts} / \mathrm{min}$
B. $\frac{3}{4 \pi} \mathrm{mts} / \mathrm{min}$
C. $\frac{3}{8 \pi} \mathrm{mts} / \mathrm{min}$
D. $\frac{7}{2 \pi} \mathrm{mts} / \mathrm{min}$

Answer: C

- Watch Video Solution

37. The slant height of a cone is fixed at 7 cm .

The rate of increase in the volume of the cone corresponding to the rate of increases of 0.3 $\mathrm{cm} / \mathrm{s}$ in the hieght when $\mathrm{h}=4 \mathrm{~cm}$ is

$$
\begin{aligned}
& \text { A. } \frac{\pi}{10} \mathrm{cc} / \mathrm{s} \\
& \text { B. } \frac{3 \pi}{10} \mathrm{cc} / \mathrm{s} \\
& \text { C. } \frac{\pi}{5} \mathrm{cc} / \mathrm{s} \\
& \text { D. } \frac{7 \pi}{10} \mathrm{cc} / \mathrm{s}
\end{aligned}
$$

## Answer: A

38. The radius of the base of a cone is increasing at the rate of $3 \mathrm{~cm} / \mathrm{min}$ and altitude is decreasing at the rate of $4 \mathrm{~cm} / \mathrm{min}$. The rate of change of lateral surface when the radius is

7 cm and altitude is 24 is
A. $180 \pi \mathrm{~cm}^{2} / \mathrm{min}$
B. $7 \pi \mathrm{~cm}^{2}$
C. $27 \pi \mathrm{~cm}^{2} / \mathrm{min}$
D. $54 \pi \mathrm{~cm}^{2} / \mathrm{min}$

Answer: A

## - Watch Video Solution

39. The radius of a right circular cylinder increases at the rate of $0.1 \mathrm{~cm} / \mathrm{min}$. and the height decreases at the rate of $0.2 \mathrm{~cm} / \mathrm{min}$. The rate of change of the volume of the cylinder. In $\mathrm{cm}^{3} / \mathrm{min}$. when the radius is 2 cm and the height is 3 cm is

$$
\text { A. }-2 p
$$

B. $-\frac{8 \pi}{5}$
C. $-\frac{3 \pi}{5}$
D. $\frac{2 \pi}{5}$

## Answer: D

## - Watch Video Solution

40. Assertion (A): The ordinate of a point describing the circle $x^{2}+y^{2}=25$ decreases at the rate of $1.5 \mathrm{~cm} / \mathrm{s}$. The rate of change of the abscissa of the point when ordinate
equals 4 cm is $2 \mathrm{~cm} / \mathrm{s}$.

Reason (R): $x d x+y d y=0$
A. Both $A$ and $B$ true and $R$ is the correct explation of $A$
B. Both $A$ and $R$ are true and $R$ is not the correct explanation of $A$
C. $A$ is true but $R$ is false
D. $A$ is false but $R$ is true

Answer: A

D Watch Video Solution

## Practice Sheet Exercise 1 Level 1 Straight

 Objective Type Question1. If a particle moves alonga straight line by
$S=4 t^{2}-8 t+3$ and the time at which the particle comes of rest is ' $t$ ' seconds then ' $2 t$ ' is
A. 2
B. 1
C. 4
D. 8

## D Watch Video Solution

## 2. The rate of change of $\sin t$ is $n$, then the rate

 of change of $\tan t$ isA. $n^{2}$
B. $1 / n^{2}$
C. $1 / n$
D. $n^{3}$

Answer: B

## D Watch Video Solution

3. A particle moves along a straight line according to the equation $s=8 \cos 2 t+4 \sin t$.

The initial velocity is
A. -5 units/sec
B. -4 units/sec
C. $23^{e}$ units/sec
D. 5 units/sec

## Answer: C

## - Watch Video Solution

4. An angle $\theta$ through which a pulley turns
with time ' t ' is completed by $\theta=t^{2}+3 t-5$
sq. cms / min Then the angular velocity for $t=$ 5 sec.
A. $5^{e} / \mathrm{sec}$
B. $13^{e} / \mathrm{sec}$
C. $23^{e} / \mathrm{sec}$
D. $35^{e} / \mathrm{sec}$

## Answer: B

## D Watch Video Solution

5. A particle moves along $a$ line by
$s=\frac{t^{3}}{3}-3 t^{2}+8 t$ then the distance travelled by the particle before if first comes to rest is
A. 20
B. $20 / 3$
C. 3
D. 60

Answer: B

## D Watch Video Solution

6. A particle ' $p$ ' moves along a straight line away from a point ' O ' obeying the relation $\mathrm{S}=$ $16+48 t-t^{3}$. The direction of ' $P$ ' after $t=4$ is
А. $\overrightarrow{O P}$
B. $\overrightarrow{P O}$
C. Rest at the instant
D. Perpendicular to $\overrightarrow{O P}$.

Answer: B

D Watch Video Solution
7. If the rate of change of sine and tangent of the same angle are equal then the angle
A. velocity
B. displacement
C. initial velocity
D. $a e^{t}$

Answer: B

## D Watch Video Solution

8. If the displacement in time $t$ of a particle is
given by $s=a e^{t}+b e^{-t}$. Then the
acceleration is equal to
A. velocity
B. displacement
C. $\in$ itialvelocity
D. $a(e)^{t}$

Answer: B

D Watch Video Solution
9. If the distance $S$ travelled by a particle in
time t is given by $\mathrm{s}=t^{2}-2 t+5$ then its acceleration is
A. 0
B. 0
C. 2
D. 3

Answer: C

## D Watch Video Solution

10. The displacement of a particle in time ' $t$ ' is given by $\quad S=t^{3}-t^{2}-8 t=18$. The
acceleration of the particle when its velocity

## vanishes is

A. 15 units/sec ${ }^{2}$
B. 10 units/sec ${ }^{2}$
C. 5 units $/ \sec ^{2}$
D. 20 units $/ \mathrm{sec}^{2}$

Answer: B
( Watch Video Solution
11. A particle moves in a straight line according to the law $v^{2}=4$ a $(\mathrm{x} \sin \mathrm{x}+\cos \mathrm{x})$ wher v is the velocity of a particle at a distance $x$ from the fixed point then the acceleration is
A. $2 a x \sin x$
B. $a x \sin x$
C. $a x \cos x$
D. $2 a x \cos x$

## Answer: D

12. The distance moved by the particle in time
't' is given by $S=t^{2}-12 t^{2}+6 t+8$. At the instant, when its acceleration is zero. The velocity is
A. 42
B. -42
C. 48
D. -48

Answer: B

## D Watch Video Solution

13. A particle moves along the $X$-axis with
velocity $\quad v=\frac{d x}{d t}=f(x) \quad$ then the
acceleration of the particle is
A. $\mathrm{f}^{\prime \prime}(\mathrm{x})$
B. $f(x)$
C. $f(x), f(x)$
D. $f(x)$

## Answer: C

## - Watch Video Solution

14. If the distance travelled by a particle is
$x=\sqrt{p t^{2}+2 q t+r}$ then the acceleration is proportional to

$$
\begin{aligned}
& \text { A. } \frac{1}{x} 1 \\
& \text { B. } \frac{1}{x^{2}} \\
& \text { C. } \frac{1}{\sqrt{x}} \\
& \text { D. } \frac{1}{x^{3}}
\end{aligned}
$$

## Answer: D

## D Watch Video Solution

15. If $a$ particle moves along $a$ line by
$S=\sqrt{1+t} \quad$ then its acceleration is
proportional to ____ of its velocity at the instant.
A. square
B. cube
C. double

## D. triple

## Answer: B

## D Watch Video Solution

16. A particle moves on a line according to the
law $s=a t^{2}+b t+c$. If the displacement after
one second is 16 cm , the velocity after 2 second is $24 \mathrm{~cm} / \mathrm{sec}$ and the acceleration is
$8 \mathrm{~cm} / \sec ^{2}$. Then (a,b,c)
A. $(4,8,6)$
B. $(4,4,8)$
C. $(8,4,4)$
D. $(8,8,4)$

## Answer: A

## D Watch Video Solution

17. A particle velocity $v$ at time is given by
$v=2 e^{2 t} \frac{\cos (\pi t)}{3}$. The least value of t at which
the acceleration becomes zero is
A. 0
B. $\frac{3}{2}$
C. $\frac{3}{\pi} \frac{\tan ^{-1}(6)}{\pi}$
D. $\frac{3}{\pi} \frac{\cot ^{-1}(6)}{\pi}$

Answer: C

## D Watch Video Solution

18. Each side of an equilateral triangle expands
at the rate of $2 \mathrm{~cm} / \mathrm{sec}$. The rate of increase of
its area when each side is 10 cm is (in $\mathrm{cm}^{2} / \mathrm{sec}$ )
A. $10 \sqrt{2} \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$
B. $10 \sqrt{3} \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$
C. $10 \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$
D. $5 \mathrm{sq} . \mathrm{cms} / \mathrm{sec}$

Answer: B

## D Watch Video Solution

19. A variable triangle $A B C$ is inscribed in a circle of diameter $x$ units. At a particular instant the rate of change of side ' a ' is $\mathrm{x} / 2$ time
the rate of change of the opposite angle $A$
then $\mathrm{A}=$
A. $\pi / 2$
B. $\pi / 3$
C. $\pi / 4$
D. $\pi / 6$

Answer: B
( Watch Video Solution
20. An aeroplane is flying horizontally at an altitude of 3000 ft directly over an observer.If
it is flying with a speed of $300 \mathrm{ft} / \mathrm{sec}$, the rate at which it is moving away from the observe when it is at 5000 ft away from the observer is
A. $200 \mathrm{ft} / \mathrm{sec}$
B. $220 \mathrm{ft} / \mathrm{sec}$
C. $240 \mathrm{ft} / \mathrm{sec}$
D. $260 \mathrm{ft} / \mathrm{sec}$

Answer: C

## - Watch Video Solution

21. A source of light is hung h mts. Directly above a straight horizontal path on which a boy a mts. In height is walking. If a boy walks at a rate of $b \mathrm{mts} / \mathrm{sec}$. from the light then the rate at which his shadow increasese.
A. $\frac{a b}{h-a} m t / \mathrm{sec}$
B. $\frac{a b}{h+a} m t / \mathrm{sec}$
C. $\frac{a b}{2(h-a)} m t / \mathrm{sec}$
D. $\frac{a b}{2(h+a)} m t / \mathrm{sec}$

## Answer: A

## D Watch Video Solution

22. If the rate of change in the perimeter of a
square is $K$ times the rate of change in its side
then $\mathrm{k}=$
A. 2
B. 3
C. 4
D. 1

## Answer: C

## - Watch Video Solution

23. The point of the ellipse $16 x^{2}+9 y^{2}=400$.

At which the ordinate decreases at the same
rate at which the abscissa increases is
A. $\left(3, \frac{16}{3}\right)$
B. $\left(-3, \frac{16}{3}\right)$
C. $\left(3, \frac{-16}{3}\right)$
D. $\left(-4, \frac{-16}{3}\right)$

## Answer: A

## D Watch Video Solution

24. A car starts from and attains the speed of 1
$\mathrm{km} / \mathrm{hr}$ nad $2, \mathrm{~ms} / \mathrm{hr}$ at the end of 1 st and 2 nd
minutes. IF the car moves on straight road, the distance travelled in 2 minutes is
A. $\frac{1}{4} \mathrm{~km}$
B. $\frac{1}{30} \mathrm{~km}$
C. 15 km
D. 20 km

Answer: B

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25. A point is moving along $y^{3}=27 x$. The interval in which the abscissa changes at slower rate than ordinate is
A. $(-2,2)$
B. $(-\infty, \infty)$
C. $(-1,1)$
D. $(-\infty,-3) \cup(3, \infty)$

Answer: C

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26. In a simple pendulum, if the rate of change
in the time period is equal to the rate of
change in the length then the length of the pendulum is

> A. $\frac{\pi}{g}$
> B. $\frac{\pi^{2}}{g}$
> C. $\pi^{2} g$
> D. $\pi g^{2}$

Answer: B
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27. A point is moving on $y=4-2 x^{2}$. The x coordinate of the point is decreasint at the rate of 5 units $/ \mathrm{sec}$. Then the rate at which y coordinate of the point is changing when the point is at $(1,2)$ is
A. 5 units/sec
B. 10unit/sec
C. 15unit/sec
D. 20unit/sec
28. At the point $(2,3)$ on the curve
$y=x^{3}-2 x+1$, the gradient of the curve
increases
A. 6 times as fast as $x$
B. 10 times as fast as $x$
C. 12 times s fast as x
D. 8 times as fast as $x$
29. A point is moving along the cubical parabola $12 y=x^{3}$. The rate of ordinate is less than the rate of abscissa when
A. $x<-2$ or $x>2$
B. $x= \pm 2$
C. $-2<x<2$
D. $x= \pm 4$
30. Moving along the x - axis there are two points with $x=10+6 t, x=3+t^{2}$, the speed with which they are reching from eachother at the time of encounter is ( $x$ is the cm and t is in seconds)
A. $16 \mathrm{~cm} / \mathrm{sec}$
B. $20 \mathrm{~cm} / \mathrm{sec}$
C. $8 \mathrm{~cm} / \mathrm{sec}$

## D. $1 \mathrm{~cm} / \mathrm{sec}$

## Answer: C

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31. The pressure $p$ and the voluem $v$ of a gas are connected by the relation $\mathrm{pv}=300$. If the
volume is increasing at the rate of 0.6 cubic cm minute then the rate of change in pressure of the gas when the volume is 30 cubic cm is
A. 2 units/min
B. 0.2 unit/min
C. -2 unit $/ \mathrm{min}$
D. -0.2 unit $/ \mathrm{min}$

## Answer: D

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32. A wheel rotates so that the angle of rotation is proportional to the square of the time. The first revolution was performed by
the wheel for 8 seconds the angular velocity at this time is
A. $\pi \mathrm{rad} / \mathrm{sec}$
B. $2 \pi \mathrm{rad} / \mathrm{sec}$
C. $\frac{\pi}{2} \mathrm{rad} / \mathrm{sec}$
D. $\frac{\pi}{3} \mathrm{rad} / \mathrm{sec}$

Answer: C

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33. If the semivertical angle of a cone is $45^{\circ}$
then the rate of change of volume of the cone is
A. curved area times the rate of change of $r$
B. base area times the rate of change of I
C. base area times the rate of change of $r$
D. base area times the rate of change of $\theta$

Answer: C

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34. The volume of a ball increases at $2 \pi c . c / \mathrm{sec}$. The rate of increase of radius when the volume is $288 \pi$ c.cms is
A. $1 / 36 \mathrm{~cm} / \mathrm{sec}$
B. $1 / 72 \mathrm{~cm} / \mathrm{sec}$
C. $1 / 18 \mathrm{~cm} / \mathrm{sec}$
D. $1 / 9 \mathrm{~cm} / \mathrm{sec}$

Answer: B

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35. A ballon is in the shape of a cone surmounted by a semi sphere. The radius of a sphere is equal to the height of the cone. If the height of the ballon is 2 then the rate of change in its volume is .......times the rate of change in its height.
A. $4 \pi$
B. $6 \pi$
C. $12 \pi$
D. $8 \pi$

## Answer: C

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36. The spherical ballon is being inflated so
that its volume increases uniformly at the rate of 40 cubic cm per minute. The rate of increase in the surface as when the radius is 8 cm is
A. 5 sq.cm/min
B. $6 \mathrm{sq} . \mathrm{cm} / \mathrm{min}$

## C. 10s sq.cm/min

D. $15 \mathrm{sq} . \mathrm{cm} / \mathrm{min}$

## Answer: C

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37. If the radius of a sphere ia equal to the height and radius of the cylinder then the ratio of the rates of increases of the volumes of the sphere and cylinder is
A. $4: 3$
B. 3: 4
C. $4: 3 \pi$
D. $3 \pi: 4$

Answer: A

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38. A rectangular vessel is of 2 mt long. 0.5 mt breadth and I mt deep. If water flows in at rate
of 900 cubic cm per sec , then the rate of increase of water level when 25 cm deep is
A. $0.09 \mathrm{~cm} / \mathrm{sec}$
B. $0.1 \mathrm{~cm} / \mathrm{sec}$
C. $0.01 \mathrm{~cm} / \mathrm{sec}$
D. $0.5 \mathrm{~cm} / \mathrm{sec}$

Answer: A
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39. The diameter and altitude of a right circular cylinder are found at a certain instant to be 20 cm and 40 cm repectively. It=f the diameter is increasing at the rate of $2 \mathrm{~cm} / \mathrm{sec}$ then the rate of change in the altitude will keep the volume constant is
A. $2 \mathrm{~cm} / \mathrm{sec}$
B. $4 \mathrm{~cm} / \mathrm{sec}$
C. $6 \mathrm{~cm} / \mathrm{sec}$
D. $-8 \mathrm{~cm} / \mathrm{sec}$

## Answer: D

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40. Sand is being poured on the ground from
the orifice of an elevated pipe and from a pile
which has always the shape of a right circular
cone whose height is equal to the radius of
the base. If the sand if falling at the rate of

1000 cubic cm per, sec, the rate at which the height of the pile is rising when the height is 40 cm is
A. $5 / 8 \pi \mathrm{~cm} / \mathrm{sec}$
B. $1 / 100 \pi \mathrm{~cm} / \mathrm{sec}$
C. $5 / 12 \pi \mathrm{~cm} / \mathrm{sec}$
D. $1 / 120 \pi \mathrm{~cm} / \mathrm{sec}$

Answer: A

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41. Gas is leaking out of a spherical ballon at the rate of 1800 cubic cm per sec. When the
radius of the ballon is 720 cm , the rate at which the surface area is shrinking is
A. $5 \mathrm{sq} . \mathrm{cm} / \mathrm{sec}$
B. $6 \mathrm{sq} . \mathrm{cm} / \mathrm{sec}$
C. 10 sq.cm/sec
D. $15 \mathrm{sq} . \mathrm{cm} / \mathrm{sec}$

Answer: A
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42. Assertion (A): If $S$ be the area of a circle having radius $x$ and $A$ the area of an euilateral triangle having side $\pi x$ at any isntant, then $\frac{d A}{d t}>\frac{d s}{d t}$ Reason (R) : $A>S$
A. Both $A$ and $R$ are true and $R$ is the correct explanation of A
B. Both $A$ and $R$ are true $R$ is not the correct explanation of A
C. A is true but $R$ is false

## D. $A$ is false but $R$ is true

## Answer: A

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43. Two cyclists move on two separate roads
angle at $60^{\circ}$ to each other at the rate of $5 \mathrm{~m} / \mathrm{s}$
and $10 \mathrm{~m} / \mathrm{s}$ respectively. The rate which they are separating from each other is
A. $5 \sqrt{3} \mathrm{~m} / \mathrm{s}$
B. $5 \mathrm{~m} / \mathrm{s}$
C. $10 \mathrm{~m} / \mathrm{s}$
D. $20 \mathrm{~m} / \mathrm{s}$

Answer: B

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