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## PHYSICS

## BOOKS - DHANPAT RAI \& CO PHYSICS

## (HINGLISH)

## Mathematical tools

Example

1. Solve the equation: $6 x^{2}-13 x+6=0$.
2. The value of acceleration due to gravity $(g)$ at height $h$ above the surface of earth is given by
$g^{\prime}=\frac{g R^{2}}{(R+h)^{2}}$. If $h \ll R$, then prove that
$g^{\prime}=g\left(1-\frac{2 h}{R}\right)$.

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3. Find $\frac{d y}{d x}$ for the following functions: $\grave{y}=\mathrm{x}^{\wedge} 5$ $+x^{\wedge} 3+10$
4. Find $\frac{d y}{d x}$ for the following functions:
$y=x+\sqrt{x}+\left(\frac{1}{\sqrt{x}}\right)$

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5. Find $\frac{d y}{d x}$ for the following functions: $y=5 x^{4}+3 x^{\frac{3}{2}}+6 x$.
6. Differentiate the following functions:
$\left(3 x^{2}+7\right)(6 x+3)$

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7. Differentiate the following functions:
$\left(\frac{x^{2}+1}{x-2}\right)$

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8. Differentiate the following functions:
$` \operatorname{sqrt}\left(4 x^{\wedge} 2-7\right)$.

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9. Find the differential coefficient of the
following functions: $\cos \left(a x^{2}+b\right)$

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10. Find the differential coefficient of the following functions: $\tan ^{3} x$

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11. Find the differential coefficient of the
following functions: $\frac{\sin x}{1-\cos x}$

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12. A particle is moving with a uniform accerleration. Its displacement at any instant t is given by $s=10 t+4.9 t^{2}$. What is initial velocity?

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13. A particle is moving with a uniform accerleration. Its displacement at any instant t is given by $s=10 t+4.9 t^{2}$. What is velocity at $t=3$ second.
14. A particle is moving with a uniform accerleration. Its displacement at any instant t is given by $s=10 t+4.9 t^{2}$. What is the uniform acceleration?

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15. A particle starts rotating from rest according to the formuls,
$\left.\theta=\left(\frac{3 t^{3}}{20}\right)-\left(\frac{t^{2}}{3}\right)\right)$ where $\theta$ is in radian
and $t$ is second. Find the angular velocity to and angular acceleration a at the end of 5 seconds.

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16. Show that power is the product of force and velocity.

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17. A balloon is being filled by air so that its volume V is gradually increasing. Find the rate of increase of volume with radius $r$ when $r=2$ units.

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18. For a particle executing simple harmonic motion, the displacement from the mean position is given by $y=a \sin (w t)$, where a, w
are constants. Find the velocity and acceleration of the particle at any instant $t$.

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19. Integrate: $x^{2}-\cos x+\left(\frac{1}{x}\right)$.

## 20. Evaluate

## $\pi / 6$ $\int_{0} \sec ^{2}$ $x d x$

## 21. Find the value of



## , where

$\mathrm{G}, \mathrm{M}$ and m are constants.
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## 22. In Fig, find the value of $x$.



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## 23. Find the value of



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24. Evaluate


M and I are constants.

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Exercise

1. Find $\frac{d y}{d x}$ for the following functions:
$y=x^{3}-3 x^{2}+3 x-\left(\frac{2}{5}\right)$.

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2. Find $\frac{d y}{d x}$ for the following functions:
$y=\frac{(x-1)(x-2)}{\sqrt{x}}$.

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3. Find $\frac{d y}{d x}$ for the following functions:
$y=\left(\sqrt{x}+\left(\frac{1}{\sqrt{x}}\right)\right)^{2}$.

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4. Differentiate the following functions:
$\left(x^{2}-4 x+5\right)\left(x^{3}-2\right)$.

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5. Differentiate the following functions:
$\left(\frac{2 x+3}{x^{2}-5}\right)$.

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6. Differentiate the following functions:
$\left(\frac{\sin x+\cos x}{\sin x-\cos x}\right.$.

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7. Differentiate the following functions: ` $\left(4 x^{\wedge} 3-\right.$ $\left.5 x^{\wedge} 2+1\right)^{\wedge} 4$.

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8. If the motion of aparticle is governed by the equation, $s=2 t^{3}-3 t^{2}+2 t+2$, find the poswition, velocity and acceleration of the particle at time $t=2 s$.
9. The angular displacement of a particle performing circular motion is
$\theta=\frac{t^{3}}{60}-\frac{t}{4}$
where $\theta$ is in radian and ' t ' is in second. Then
the angular velocity and angular acceleraion of a particle at the end of 5 s will be

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10. Show that force can be expressed as the product of mass and acceleration. [Hint

$$
\left.F=\left(d \frac{p}{d t}\right)-\left(\frac{d}{d t}\right) m v-m\left(d \frac{v}{d t}\right)-m a\right]
$$

$6 x+5 x^{2}-2 x^{3}+\left(\frac{1}{x^{2}}\right)$

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12. Integrate the following: $a x^{2}+b x+c$
13. Integrate the following: $\left(x+\left(\frac{1}{x}\right)\right)^{3}$

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14. 

Integrate
the
following:
$\left.3 \operatorname{cosec}{ }^{2} x-5 x+\sin x\right)$

## D Watch Video Solution

15. Integrate the following:
$\left.3 \operatorname{cosec}{ }^{2} x+2 \sin 3 x\right)$

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16. Evaluate the following integrals:
(2)

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17. Evaluate the following integrals:


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## 18. Evaluate the following integrals:



## 19. Evaluate the following integrals:

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20. Evaluate the following integrals:


