CHAPTER V

(1) Let "h" be the height of the tank. Then the rate of change of presure "p" of the tank with respect to height is

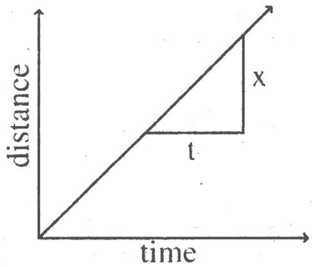
(1) $\frac{dh}{dt}$ (2) $\frac{dp}{dt}$ (3) $\frac{dh}{dp}$ (4) $\frac{dp}{dh}$

(2) If the temperature $\theta°C$ of the certain metal rod of "l" metres is given by $l = 1 + 0.00005\theta + 0.0000004\theta^2$ then the rate of change of l in $m/C°$ when the temperature is $100°C$ is

(1) $0.00013\ m/C°$ (2) $0.00023\ m/C°$

(3) $0.00026\ m/C°$ (4) $0.00033\ m/C°$

(3) The following graph gives the functional relationship between distance and time of a moving car in m/sec. The speed of the car is



(1) $\frac{x}{t}\ m/s$ (2) $\frac{t}{x}\ m/s$

(3) $\frac{dx}{dt}\ m/s$ (4) $\frac{dt}{dx}\ m/s$

(4) The distance – time relationship of a moving body is given by $y = F(t)$ then the acceleration of the body is the

(1) gradient of the velocity / time graph

(2) gradient of the distance / time graph

(3) gradient of the acceleration / time graph

(4) gradient of the velocity / distance graph

(5) The distance travelled by a car in "t" seconds is given by $x = 3t^3 - 2t^2 + 4t - 1$. Then the initial velocity and initial acceleration respectively are

(1) $(-4m/s, 4\ m/s^2)$ (2) $(4m/s, -4m/s^2)$

(3) (0, 0) (4) $(18.25\ m/s, 23\ m/s^2)$

(6) The angular displacement of a fly wheel in radians is given by $\theta = 9t^2 - 2t^3$. The time when the angular acceleration zero is

(1) 2.5 s (2) 3.5 s (3) 1.5 s (4) 4.5 s

(7) Food pockets were dropped from an helicopter during the flood and distance fallen in "t" seconds is given by $y = \frac{1}{2}gt^2$ $(g = 9.8\ m/s^2)$. Then the speed of the food pocket after it has fallen for "2" seconds is

(1) 19.6 m/sec (2) 9.8 m/sec (3) – 19.6 m/sec (4) – 9.8 m/sec

(8) An object dropped from the sky follows the law of motion $x = \frac{1}{2} gt^2$

($g = 9.8\ m/sec^2$) The acceleration of the object when $t = 2$ is

(1) -9.8 m/sec^2 (2) 9.8 m/sec^2

(3) 19.6 m/sec^2 (4) -19.6 m/sec^2

(9) A missile fired from ground level rises x metres vertically upwards in "t" seconds and $x = t(100 - 12.5\ t)$. Then the maximum height reached by the missile is

(1) $100\ m$ (2) $150\ m$ (3) $250\ m$ (4) $200\ m$

(10) A continuous graph $y = f(x)$ is such that $f'(x) \to \infty$ as $x \to x_1$, at (x_1, y_1) Then $y = f(x)$ has a

(1) vertical tangent $y = x_1$ (2) horizontal tangent $x = x_1$

(3) vertical tangent $x = x_1$ (4) horizontal tangent $y = y_1$

(11) The curve $y = f(x)$ and $y = g(x)$ cut orthogonally if at the point of intersection

(1) slope of $f(x)$ = slope of $g(x)$ (2) slope of $f(x)$ + slope of $g(x) = 0$

(3) slope of $f(x)$ / slope of $g(x) = -1$ (4) [slope of $f(x)$] [slope of $g(x)$] $= -1$

(12) The law of the mean can also be put in the form

(1) $f(a + h) = f(a) - hf'(a + \theta h) \quad 0 < \theta < 1$

(2) $f(a + h) = f(a) + hf'(a + \theta h) \quad 0 < \theta < 1$

(3) $f(a + h) = f(a) + hf'(a - \theta h) \quad 0 < \theta < 1$

(4) $f(a + h) = f(a) - hf'(a - \theta h) \quad 0 < \theta < 1$

(13) l'Hôpital's rule cannot be applied to $\frac{x+1}{x+3}$ as $x \to 0$ because $f(x) = x + 1$ and $g(x) = x + 3$ are

(1) not continuous

(2) not differentiable

(3) not in the indeterminate form as $x \to 0$

(4) in the indeterminate form as $x \to 0$

(14) If $\lim\limits_{x \to a} g(x) = b$ and f is continuous at $x = b$ then

(1) $\lim\limits_{x \to a} g(f(x)) = f\left(\lim\limits_{x \to a} g(x)\right)$ (2) $\lim\limits_{x \to a} f(g(x)) = f\left[\lim\limits_{x \to a} g(x)\right]$

(3) $\lim\limits_{x \to a} f(g(x)) = g\left(\lim\limits_{x \to a} f(x)\right)$ (4) $\lim\limits_{x \to a} f(g(x)) \neq f\left(\lim\limits_{x \to a} g(x)\right)$

(15) $\lim\limits_{x \to 0} \frac{x}{\tan x}$ is

(1) 1 (2) -1 (3) 0 (4) ∞

(16) f is a real valued function defined on an interval $I \subset R$ (R being the set of real numbers) increases on I. Then

(1) $f(x_1) \leq f(x_2)$ whenever $x_1 < x_2$ $x_1, x_2 \in I$

(2) $f(x_1) \geq f(x_2)$ whenever $x_1 < x_2$ $x_1, x_2 \in I$

(3) $f(x_1) \leq f(x_2)$ whenever $x_1 > x_2$ $x_1, x_2 \in I$

(4) $f(x_1) > f(x_2)$ whenever $x_1 > x_2$ $x_1, x_2 \in I$

(17) If a real valued differentiable function $y = f(x)$ defined on an open interval I is increasing then

(1) $\frac{dy}{dx} > 0$ (2) $\frac{dy}{dx} \geq 0$ (3) $\frac{dy}{dx} < 0$ (4) $\frac{dy}{dx} \leq 0$

(18) f is a differentiable function defined on an interval I with positive derivative. Then f is

(1) increasing on I (2) decreasing on I

(3) strictly increasing on I (4) strictly decreasing on I

(19) The function $f(x) = x^3$ is

(1) increasing (2) decreasing

(3) strictly decreasing (4) strictly increasing

(20) If the gradient of a curve changes from positive just before P to negative just after then "P" is a

(1) minimum point (2) maximum point

(3) inflexion point (4) discontinuous point

(21) The function $f(x) = x^2$ has

(1) a maximum value at $x = 0$ (2) minimum value at $x = 0$

(3) finite no. of maximum values (4) infinite no. of maximum values

(22) The function $f(x) = x^3$ has

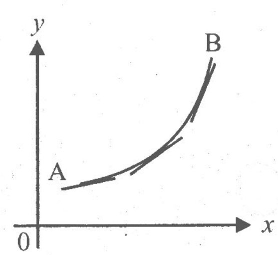
(1) absolute maximum (2) absolute minimum

(3) local maximum (4) no extrema

(23) If f has a local extremum at a and if $f'(a)$ exists then

(a) $f'(a) < 0$ (2) $f'(a) > 0$ (3) $f'(a) = 0$ (4) $f''(a) = 0$

(24) In the following figure, the curve $y = f(x)$ is



(1) concave upward

(2) convex upward

(3) changes from cancavity to convexity

(4) changes from convexity and concavity

(25) The point that separates the convex part of a continuous curve from the concave part is

(1) the maximum point (2) the minimum point

(3) the inflextion point (4) critical point

(26) f is a twice differentiable function on an interval I and if $f''(x) > 0$ for all x in the domain I of f then f is

(1) concave upward (2) convex upward

(3) increasing (4) decreasing

(27) $x = x_0$ is a root of even order for the equation $f'(x) = 0$ then $x = x_0$ is a

(1) maximum point (2) minimum point

(3) inflexion point (4) critical point

(28) If x_0 is the x-coordinate of the point of inflection of a curve $y = f(x)$ then (Second derivative exists)

(1) $f(x_0) = 0$ (2) $f'(x_0) = 0$ (3) $f''(x_0) = 0$ (4) $f''(x_0) \neq 0$

(29) The statement "If f is continuous on a closed interval $[a, b]$ then f attains an absolute maximum value $f(c)$ and an absolute minimum value $f(d)$ at some number c and d in $[a, b]$" is

(1) The extreme value theorem (2) Fermat's theorem

(3) Law of Mean (4) Rolle's theorem

(30) The statement : "If f has a local extremum (minimum or maximum) at c and if $f'(c)$ exists then $f'(c) = 0$" is

(1) the extreme value theorem (2) Fermat's theorem

(3) Law of Mean (4) Rolle's theorem

(31) Identify the false statement :

(1) all the stationary numbers are critical numbers.

(2) at the stationary point the first derivative is zero

(3) at critical numbers the first derivative need not exist

(4) all the critical numbers are stationary numbers

(32) Identify the correct statement .

(a) a continuous function has local maximum then it has absolute maximum

(b) a continuous function has local minimum then it has absolute minimum

(c) a continuous function has absolute maximum then it has local maximum

(d) a continuous function has absolute minimum then it has local minimum

(1) (a) and (b) (2) (a) and (c) (3) (c) and (d) (4) (a), (c) and (d)

(33) Identify the correct statements.

(a) Every constant function is an increasing function

(b) Every constant function is a decreasing function

(c) Every identity function is an increasing function

(d) Every identity function is a decreasing function

(1) (a), (b) and (c) (2) (a) and (c) (3) (c) and (d) (4) (a), (c) and (d)

(34) Which of the following statement is incorrect?

(1) Initial velocity means velocity at $t = 0$

(2) Initial acceleration means acceleration at $t = 0$

(3) If the motion is upward, at the maximum height, the velocity is not zero

(4) If the motion is horizontal, $v = 0$ when the particle comes to rest

(35) Which of the following statements are correct (m_1 and m_2 are slopes of two lines)

(a) If the two lines are perpendicular then $m_1 m_2 = -1$

(b) If $m_1 m_2 = -1$ then the two lines are perpendicular

(c) If $m_1 = m_2$ then the two lines are parallel

(d) If $m_1 = -\frac{1}{m_2}$ then the two lines are perpendicular

(1) (b), (c) and (d) (2) (a), (b) and (d)

(3) (c) and (b) (4) (a) and (b)

(36) One of the conditions of Rolle's theorem is

(1) f is defined and continuous on (a, b)

(2) f is differentiable on $[a, b]$

(3) $f(a) = f(b)$

(4) f is differentiable on $(a, b]$

(37) If a and b are two roots of a polynomial $f(x) = 0$ then Rolle's theorem says that there exists atleast

(1) one root between a and b for $f'(x) = 0$

(2) two roots between a and b for $f'(x) = 0$

(3) one root between a and b for $f''(x) = 0$

(4) two roots between a and b for $f''(x) = 0$

(38) A real valued function which is continuous on $[a, b]$ and differentiable on (a, b) then there exists atleast one c in

(1) $[a, b]$ such that $f'(c) = 0$ (2) (a, b) such that $f'(c) = 0$

(3) (a, b) such that $\frac{f(b) - f(a)}{b - a} = 0$ (4) (a, b) such that $\frac{f(b) - f(a)}{b - a} = f'(c)$