



إسم الطالب :	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Total
الرقم الجامعي :							
المدرس :	16	14	14	20	16	20	100

Answer the following questions:

Q.1 (a) Find $\frac{dy}{dx}$ if $y = \frac{\tan \sqrt{x}}{1 + \sin x}$.

(b) Find $\frac{dy}{dx}$ if $y = \int_1^{x^4} \frac{t + \sqrt{t}}{2 + \cos t} dt$.

(c) Evaluate $\lim_{x \rightarrow \infty} \frac{2x + x \sin(3x)}{5x^2 - 2x + 1}$.

Q.2 (a) Let $f(x) = \begin{cases} \frac{\sin x}{|x|}, & x \neq 0 \\ 1, & x = 0. \end{cases}$ Determine whether $f(x)$ is continuous or not at $x = 0$.

(b) Find the length of the curve $y = x^{1/2} - \frac{1}{3}x^{3/2}$ from $x = 1$ to $x = 4$.

Q.3 Evaluate the following integrals:

(a) $\int_1^{\sqrt{2}} x^3(x^2 - 1)^7 \, dx$

(b) $\int \sqrt{\frac{\cos x + \sin x}{\cos^5 x}} \, dx$

Q.4 Let $f(x) = \frac{x^2 + 1}{x^2 - 1}$.

(a) Find the domain of the function f .

(b) Find all asymptotes of the graph of f .

(c) Find the intervals on which the function f is increasing and decreasing.

(d) Find the local extreme values of f .

(e) Find the inflection points of f and find the intervals on which the graph of f is concave up and concave down.

(f) Find the x -intercepts and the y -intercepts, and sketch the graph of f .

Q.5 (a) Find the area of the region enclosed by the curve $y = 4x^2$ and the line $y = 8 - 4x$.

(b) Find the volume of the solid generated by revolving the region enclosed by the parabola $x = y^2$ and the line $x = 4$ about the y-axis.

Q.6 Choose the correct answer for each of the following:

- (i) If $f(x) = x^3 + x - 2$ and $g(x) = 2 - \sqrt{x}$, then $\text{Dom}\left(\frac{f}{g}\right)$ equals
(a) $(0, \infty)$ (b) $(4, \infty)$
(c) $(0, \infty) - \{4\}$ (d) $[0, \infty) - \{4\}$
- (ii) The range of $f(x) = \sqrt{\cos^2 x}$ is
(a) $[0, 1]$ (b) $(-1, 1)$ (c) $[-1, 1]$ (d) $(0, 2)$
- (iii) If $f(x) = x^2$, $g(x) = \sin x$ and $h(x) = \cos x$, then $f(h(x)) - f(g(x))$ equals
(a) $\tan(2x)$ (b) $\sin(2x)$
(c) $\cos(2x)$ (d) none of the above
- (iv) The curve $y = \sin x + \cos x$, $x \in [0, \pi]$, has a horizontal tangent at the point
(a) $(\frac{\pi}{4}, \sqrt{2})$ (b) $(0, 1)$ (c) $(\frac{\pi}{2}, 1)$ (d) $(-1, \pi)$
- (v) If $\lim_{x \rightarrow c} f(x)$ exists and $\lim_{x \rightarrow c} f(x)g(x) = 8$ then $\lim_{x \rightarrow c} g(x)$
(a) equals 8 (b) exists and does not equal 8
(c) does not exist (d) may or may not exist
- (vi) If $f(x) = |x - 5|$, then
(a) $f(x)$ is not differentiable at $x = 5$ (b) $f'(x) = \begin{cases} 1, & x > 5 \\ -1, & x < 5. \end{cases}$
(c) $f'(x) = \frac{x - 5}{|x - 5|}$ (d) all of the above
- (vii) If $f(x)$ is a decreasing function on an interval I , then $g(x) = \frac{1}{f(x)}$
(a) is decreasing on I (b) is increasing on I
(c) may be increasing or may be decreasing on I (d) is constant on I
- (viii) Let f be a continuous function on the interval $[0, 2]$ and assume that $f(0)f(1) < 0$. Then there is a point c such that
(a) $c \in (0, 1)$ and $f(c) = 0$ (b) $c \in (0, 1)$ and $f'(c) = 0$
(c) $c \in (1, 2)$ and $f(c) = 0$ (d) none of the above
- (ix) If $f(x) = x^9 - x$, then there is a number $c \in (0, 1)$ such that
(a) $f(c) = 0$ (b) $f'(c) = 0$ (c) $f(c) = 1$ (d) $f'(c) = 1$
- (x) If f is continuous and increasing on an interval $[a, b]$, then
(a) $f(x) \leq f(a)$ for all $x \in [a, b]$ (b) $f(x) \geq f(b)$ for all $x \in [a, b]$
(c) $f(x) \leq f(b)$ for all $x \in [a, b]$ (d) all of the above