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Answer the following questions :

[Q1] Underline the correct answer of the following [20 marks]

- a) The solution set of the inequality $\frac{3}{x^2 - 1} \geq 1$ is
 i. $(-2, 2)$ ii. $[-2, 2]$ iii. $[-2, -1) \cup (1, 2]$ iv. $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$.
- b) The equation of the normal to the curve $y^2 + 2x = y$ at $(0, 0)$ is
 i. $y = 2x$ ii. $y = -2x$ iii. $x = 2y$ iv. $x = -2y$.
- c) If $y = f(x \sin x)$, then $\frac{dy}{dx}$ equals
 i. $f'(x \sin x)$ ii. $\sin x f'(x \sin x)$ iii. $\cos x f'(x \sin x)$ iv. $[\sin x + x \cos x] f'(x \sin x)$.
- d) The function $f(x) = \frac{x + \sin x}{|x|}$ is
 i. even ii. odd iii. neither iv. both.
- e) The period of the function $f(x) = \tan\left(2x - \frac{\pi}{3}\right)$ is
 i. $\frac{\pi}{2}$ ii. π iii. 2π iv. $\frac{\pi}{6}$.
- f) $\lim_{x \rightarrow 4} \frac{[x - 3]}{x - 3}$
 i. equal 1 ii. equal 0 iii. equal ∞ iv. does not exist.
- g) The range of the function $f(x) = \sqrt{x^2 + 4}$ is
 i. $[4, \infty)$ ii. $[2, \infty)$ iii. $[0, \infty)$ iv. $(-\infty, 2]$.
- h) The axis of the parabola $2y - 3x^2 + 6x + 1 = 0$ is
 i. $x = 1$ ii. $x = -1$ iii. $y = 1$ iv. $2y = -1$ v. $2x = 1$.
- i) If $f(x) = 1 + \frac{1}{x^2}$ and $(f \circ g)(x) = x^2$, then $g(x)$ equals
 i. $x^2 - 1$ ii. $\sqrt{x^2 - 1}$ iii. $\frac{1}{\sqrt{x^2 - 1}}$ iv. $\frac{1}{x^2 - 1}$.
- j) The function $f(x) = |x^2|$ is
 i. continuous everywhere but is not differentiable at $x = 0$,
 ii. differentiable everywhere but is not continuous at $x = 0$,
 iii. differentiable everywhere,
 iv. continuous every where but nowhere differentiable.

[Q2] Use the following graph of $y = f(x)$ to complete the following sentences,

[12 marks]

a. $\lim_{x \rightarrow 0^-} f(x)$

b. $\lim_{x \rightarrow 0^+} f(x)$

c. $\lim_{x \rightarrow \infty} f(x)$

d. $\lim_{x \rightarrow 1} f(x)$

e. $f(x)$ is not at $x = 3$.

f. The domain of $f(x)$ is

g. The range of $f(x)$ is

h. A point where f is defined but is not continuous is $x =$

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[Q3] Graph $y = |x^2 - 3| + 3$.

[6 marks]

[Q4] Find $\frac{dy}{dx}$, where $\cot y + \sin^2(x + x^3) = 5$.

[6 marks]

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[Q5] Find $\lim_{x \rightarrow 0} \frac{x^2 - x^2 \cos 3x}{\sin^4 3x}$.

[6 marks]

Good Luck

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