MS 121 IT Mathematics Sample Test 3

Questions 1-5 are worth 1 mark each. Questions 6-10 are worth 2 marks each.

1. The limit as $x \to 1$ of the function

$$f(x) = \frac{x^3 - 3x + 2}{x^3 + x^2 - 6x + 4}$$

is equal to:

(A) 1 **(B)** 0 **(C)** -1 **(D)** ∞ **(E)** None of the previous.

2. The limit as $x \to \infty$ of the function

$$f(x) = \frac{2x^4 - 5x^3 + 2x^2 + 1}{5x^4 + 6x^2 - 5x + 3}$$

is equal to:

(A) 0 **(B)** $-\infty$ **(C)** ∞ **(D)** $\frac{2}{5}$ **(E)** None of the previous.

3. The derivative of the function $f(x) = 6x^4 - \frac{5}{x^5}$ is:

(A) $6x^3 + \frac{25}{x^4}$ **(B)** $24x^3 + \frac{25}{x^6}$ **(C)** $18x^3 - \frac{25}{x^6}$

(D) $24x^3 + \frac{20}{x^4}$ **(E)** None of the previous.

4. The derivative of the function $f(x) = (3x^2 + 1)^{-2}$ is:

(A) $-12x(3x^2 + 1)^{-3}$ **(B)** $-12(3x^2 + 1)^{-1}$ **(C)** $-6x(3x^2 + 1)^{-3}$

(D) $-12(3x^2 + 1)^{-3}$ **(E)** None of the previous.

5. Evaluate the following integral: $\int_1^2 x^2 - \frac{1}{x^2}\, dx$.

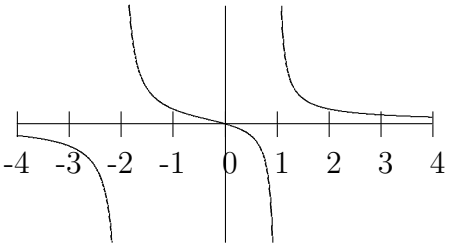
(A) $\frac{11}{6}$ **(B)** $\frac{17}{6}$ **(C)** $\frac{49}{24}$ **(D)** $\frac{63}{24}$ **(E)** None of the previous.

6. The function $f(x) = \dfrac{x}{x^2+1}$ is increasing on the interval(s):

(A) $(-\infty, -1)$ **(B)** $(-\infty,\ 1)$ **(C)** $(-\infty, -1)$ and $(1,\ \infty)$

(D) $(-1,\ 1)$ **(E)** None of the previous.

7. The following curve in the xy-plane



most closely represents the graph of $f(x) =$:

(A) $\dfrac{x^2}{(x+2)(x-1)}$ **(B)** $\dfrac{x}{(x+2)(x-1)}$ **(C)** $\dfrac{x}{(x-2)(x+1)}$

(D) $\dfrac{x}{(x+2)(x-1)^2}$ **(E)** $\dfrac{x^2}{(x-2)(x+1)}$.

8. On the interval $[0,\ 3]$ the function $f(x) = \dfrac{x-3}{x+1}$ takes its maximum value at :

(A) $x = 0$ **(B)** $x = 1$ **(C)** $x = 2$ **(D)** $x = 3$ **(E)** None of the previous.

9. Determine the following integral:

$$\int \frac{x+4}{(x^2+8x-6)^2}dx.$$

(A) $-\dfrac{1}{x^2+8x-6}+C$ **(B)** $-\dfrac{1}{3(x^2+8x-6)^3}+C$ **(C)** $-\dfrac{1}{2(x^2+8x-6)}+C$ **(D)** $-\dfrac{1}{6(x^2+8x-6)^3}+C$ **(E)** None of the previous.

10. Evaluate the following integral:

$$\int_{-1}^{1} x(x+1)^3\,dx.$$

(A) $-\frac{1}{5}$ **(B)** 0 **(C)** 4 **(D)** $\frac{12}{5}$ **(E)** None of the previous.