Name _____ **DUE DATE:** _____

Directions:

- *Read each problem carefully and use your knowledge of calculus to determine your answer.*
- *In order to receive FULL CREDIT you must either SHOW ALL WORK or EXPLAIN how you got your answer!! PLEASE NOTE: A multiple choice answer alone without any work will only receive half credit.*

1) Let f be the function defined by the following.

$$f(x)=\begin{cases}\sin x, & x<0\\ x^2, & 0\le x<1\\ 2-x, & 1\le x<2\\ x-3, & x\ge 2\end{cases}$$

For what values of x is f NOT continuous?

(A) 0 only (B) 1 only (C) 2 only (D) 0 and 2 only (E) 0, 1, and 2

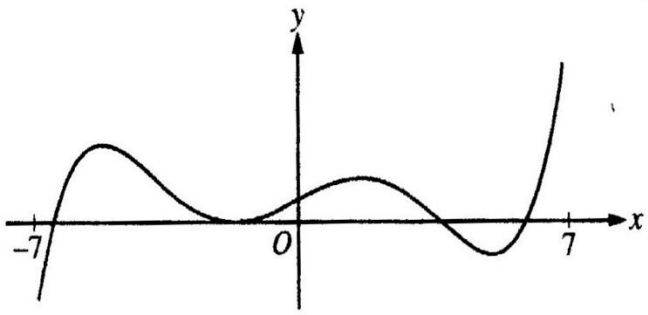
2) A particle moves along the x-axis so that at any time $t \geqq 0$ its position is given by $x(t) = t^3 - 3t^2 - 9t + 1$. For what values of t is the particle at rest?

(A) No values (B) 1 only (C) 3 only (D) 5 only (E) 1 and 3

3) $\int_0^1 (3x-2)^2 dx =$

(A) $-\frac{7}{3}$ (B) $-\frac{7}{9}$ (C) $\frac{1}{9}$ (D) 1 (E) 3

4)



Graph of f'

The figure above shows the graph of f', the derivative of the function f, on the open interval $-7 < x < 7$. If f' has four zeros on $-7 < x < 7$, how many relative maxima does f have on $-7 < x < 7$?

(A) One (B) Two (C) Three (D) Four (E) Five

5) If $\lim_{x\to 3} f(x) = 7$, which of the following must be true?

I. f is continuous at $x = 3$
II. f is differentiable at $x = 3$
III. $f(3) = 7$

(A) None (B) II only (C) III only (D) I and III only (E) I, II, and III

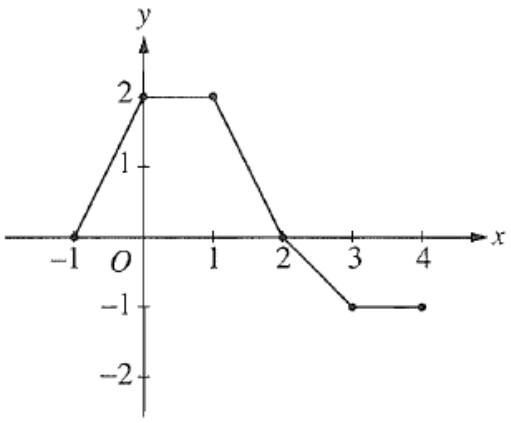
6) If $\int_1^{10} f(x)dx = 4$ and $\int_{10}^{3} f(x)dx = 7$, then $\int_1^3 f(x)dx =$

(A) 11 (B) 3 (C) -3 (D) 28 (E) none of these

7) If $x + 2xy - y^2 = 2$, then at the point $(1,1)$, $\frac{dy}{dx}$ is

(A) $-\frac{1}{2}$ (B) $\frac{3}{2}$ (C) 0 (D) -3 (E) undefined

8)



The graph of a piecewise-linear function f, for $-1 \le x \le 4$, is shown above. What is the value of $\int_{-1}^{4} f(x)\,dx$?

(A) 1 (B) 2.5 (C) 4 (D) 5.5 (E) 8

9)

x	−4	−3	−2	−1	0	1	2	3	4
$g'(x)$	2	3	0	−3	−2	−1	0	3	2

The derivative g' of a function g is continuous and has exactly two zeros. Selected values of g' are given in the table above. If the domain of g is the set of all real numbers, then g is decreasing on which of the following intervals?

(A) $-2 \le x \le 2$ only

(B) $-1 \le x \le 1$ only

(C) $x \ge -2$

What is the x-coordinate of the point of inflection on the graph of $y = \frac{1}{3}x^3 + 5x^2 + 24$?

(E) $x \le -2$ or $x \ge 2$

10) What is the x −coordinate of the point of inflection on the graph of $y = \frac{1}{3}x^3 + 5x^2 + 24$?

(A) -10 (B) -6 (C) 0 (D) 5 (E) none of these

11) Let f be the function given by $f(x) = \sqrt{x^4 - 16x^2}$.

(a) Find the domain of f.

(b) Describe the symmetry, if any, of the graph of f.

(c) Find $f'(x)$.

(d) Find the slope of the line normal to the graph of f at $x = 5$.

12) A particle moves along the x-axis in such a way that its position at time t is given by $x = 3t^4 - 16t^3 + 24t^2$ for $-5 \le t \le 5$.

(a) Determine the velocity and acceleration of the particle at time t.

(b) At what values of t is the particle at rest?

(c) At what values of t does the particle change direction?

(d) What is the velocity when the acceleration is first zero?