**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) $\int_0^8 \frac{dx}{\sqrt{1+x}} =$

(A) 1 (B) $\frac{3}{2}$ (C) 2 (D) 4 (E) 6

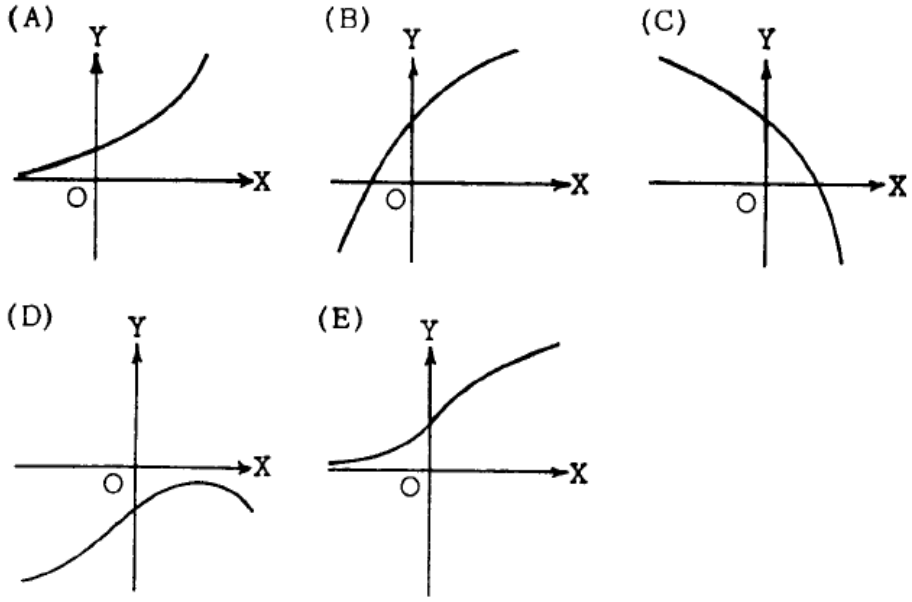
2) If $\begin{cases} f(x) = \dfrac{\sqrt{2x+5}-\sqrt{x+7}}{x-2}, & \text{for } x \neq 2, \\ f(2) = k \end{cases}$ and if $f$ is continuous at $x = 2$, then $k =$

(A) 0 (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) 1 (E) $\frac{7}{5}$

3) If $3x^2 + 2xy + y^2 = 2$, then the value of $\frac{dy}{dx}$ at $x = 1$ is

(A) –2 (B) 0 (C) 2 (D) 4 (E) not defined

4) If $y$ is a function $x$ such that $y' > 0$ for all $x$ and $y'' < 0$ for all $x$, which of the following could be part of the graph of $y = f(x)$?




5)

$$f(x) = \begin{cases} x + 2 & \text{if } x \le 3 \\ 4x - 7 & \text{if } x > 3 \end{cases}$$

Let $f$ be the function given above. Which of the following statements are true about $f$ ?

I. $\lim_{x \to 3} f(x)$ exists.

II. $f$ is continuous at $x = 3$.

III. $f$ is differentiable at $x = 3$.

(A) None

(B) I only

(C) II only

(D) I and II only

(E) I, II, and III

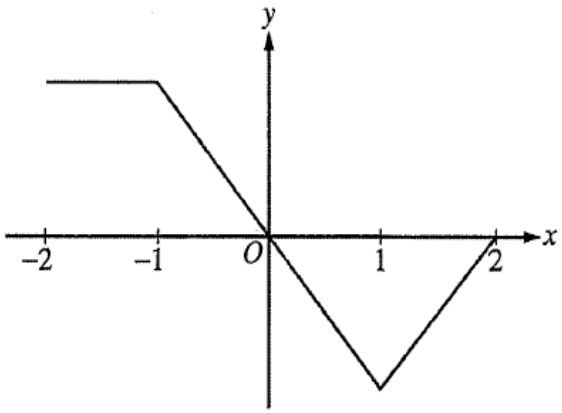
6) For what value of $x$ does the function $f(x)=(x-2)(x-3)^2$ have a relative maximum?

(A) $-3$ (B) $-\frac{7}{3}$ (C) $-\frac{5}{2}$ (D) $\frac{7}{3}$ (E) $\frac{5}{2}$

7) If $f(x)=\sin\left(\frac{x}{2}\right)$, then there exists a number $c$ in the interval $\frac{\pi}{2}<x<\frac{3\pi}{2}$ that satisfies the conclusion of the Mean Value Theorem. Which of the following could be $c$?

(A) $\frac{2\pi}{3}$ (B) $\frac{3\pi}{4}$ (C) $\frac{5\pi}{6}$ (D) $\pi$ (E) $\frac{3\pi}{2}$

8)




Graph of $f'$

The graph of $f'$, the derivative of the function $f$, is shown above. Which of the following statements is true about $f$ ?

(A) $f$ is decreasing for $-1 \le x \le 1$.

(B) $f$ is increasing for $-2 \le x \le 0$.

(C) $f$ is increasing for $1 \le x \le 2$.

(D) $f$ has a local minimum at $x = 0$.

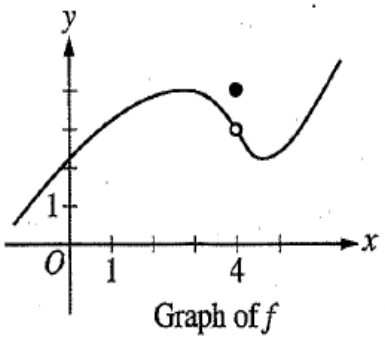
(E) $f$ is not differentiable at $x = -1$ and $x = 1$.

9) If $f(x)=(x-1)^2 \sin x$, then $f'(0)=$

(A) $-2$ (B) $-1$ (C) 0 (D) 1 (E) 2

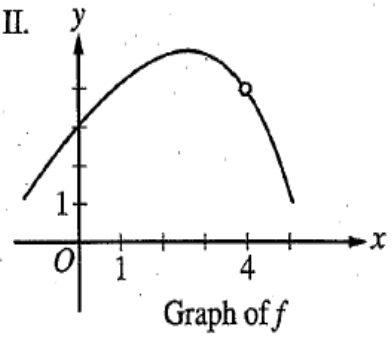
10) For which of the following does $\lim_{x\to 4} f(x)$ exist?

I.



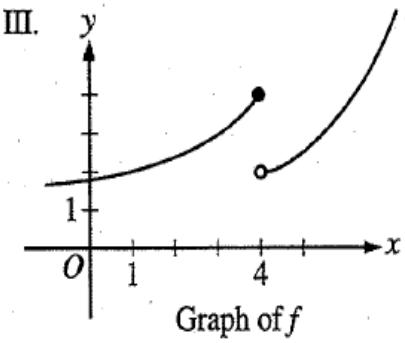

Graph of $f$

II.




Graph of $f$

III.




Graph of $f$

(A) I only

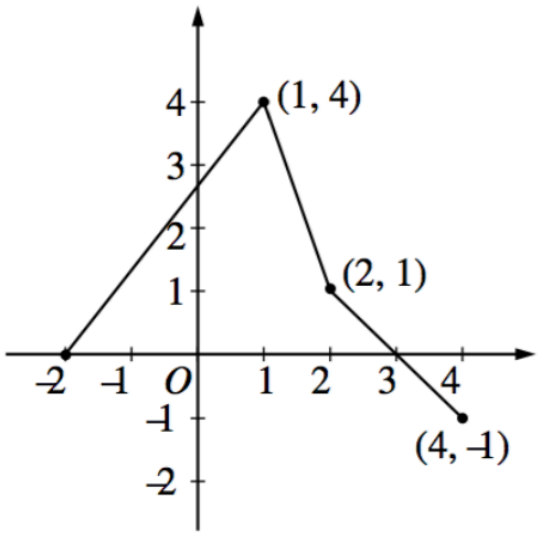
(B) II only

(C) III only

(D) I and II only

(E) I and III only

11)




The graph of the function $f$, consisting of three line segments, is shown above. Let $g(x)=\int_1^x f(t)\,dt$.

(a) Compute $g(4)$ and $g(-2)$.

(b) Find the instantaneous rate of change of $g$, with respect to $x$, at $x=1$.

(c) Find the absolute minimum value of $g$ on the closed interval $[-2,4]$. Justify your answer.

(d) The second derivative of $g$ is not defined at $x=1$ and $x=2$. How many of these values are $x$-coordinates of points of inflection of the graph of $g$? Justify your answer.

12) Consider the graph of $f(x) = x^4 - 6x^2$.

a) Find the relative maxima and minima (both x and y coordinates).

b) Find the coordinates of the point(s) of inflection.

c) Determine the interval(s) on which the function is increasing.

d) Determine the interval(s) on which the function is concave up.