

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) Given that $f(x) = \begin{cases} 3 - 4x & \text{for } x \leq 0 \\ x^2 & \text{for } 0 < x < 2 \\ 3x - 4 & \text{for } x \geq 2 \end{cases}$

Find $\lim_{x \rightarrow 2^-} f(x)$.

- A. -5
- B. 2
- C. 4
- D. 6
- E. The limit does not exist.

2) If $y = \arctan(3x)$, then $\left. \frac{dy}{dx} \right|_{x=1} =$

- A. $\frac{1}{10}$
- B. $\frac{1}{4}$
- C. $\frac{3}{10}$
- D. $\frac{1}{3}$
- E. $\frac{3}{4}$

3) $\frac{d}{dx} \left[\frac{\cos x}{\sin x + 1} \right] =$

- A. $\sin x + 1$
- B. $-\csc^2 x - \sin x$
- C. $-\csc^2 x + 1$
- D. $\frac{-\sin x}{\sin x + 1}$
- E. $\frac{-1}{1 + \sin x}$

4) The graph of $y = e^{-x^2}$ has a point of inflection at

- A. $x = 0$
- B. $x = \pm 2$
- C. $x = \pm \sqrt{2}$
- D. $x = \frac{\pm \sqrt{2}}{2}$
- E. The graph has no points of inflection.

5) Find the equation of the line that is tangent to the curve $xy - x + y = 2$ at the point where $x = 0$.

- A. $y = -x$
- B. $y = \frac{1}{2}x + 2$
- C. $y = x + 2$
- D. $y = 2$
- E. $y = -x + 2$

6) The radius of a circle is increasing at the rate of 3 meters per second. Find the rate, in square meters per second, at which the area of the circle is changing when the area is $16\pi \text{ m}^2$.

- A. $8\pi \text{ m}^2/\text{s}$
- B. $12\pi \text{ m}^2/\text{s}$
- C. $24\pi \text{ m}^2/\text{s}$
- D. $96\pi \text{ m}^2/\text{s}$
- E. $96\pi^2 \text{ m}^2/\text{s}$

7) $\int 3xe^{2x} dx =$

- A. $3xe^{2x} e - e^{2x} + C$
- B. $6xe^{2x} - 4e^{2x} + C$
- C. $xe^{2x} - 3e^{2x} + C$
- D. $\frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x} + C$
- E. $\frac{3}{2}xe^{2x} - \frac{3}{4}e^{2x} + C$

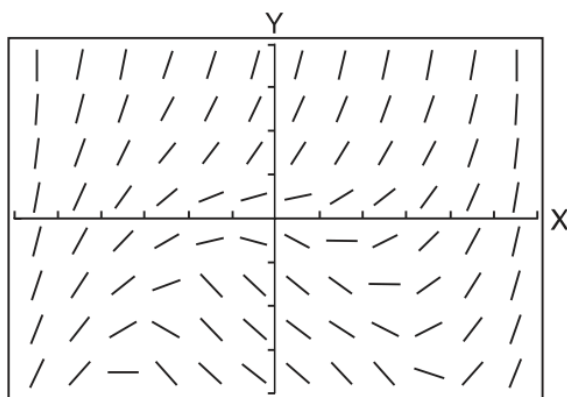
8) The average value of $\tan x$ on the interval from $x = 0$ to $x = \pi/3$ is

- A. $\ln \frac{1}{2}$
- B. $\frac{3}{\pi} \ln 2$
- C. $\ln 2$
- D. $\frac{\sqrt{3}}{2}$
- E. $\frac{9}{\pi}$

9) A particle moves along a horizontal path such that its position at any time $t (t \geq 0)$ is given $s(t) = t^3 - 4t^2 + 4t + 5$. The particle is moving right for

- A. $t > 2$ only
- B. $0 < t < \frac{2}{3}$ only
- C. $\frac{2}{3} < t < 2$
- D. $0 < t < \frac{2}{3}$ or $t > 2$
- E. $t > \frac{2}{3}$

10)



Above is the slope field for which of the following differential equations?

- A. $\frac{dy}{dx} = \sin x$
- B. $\frac{dy}{dx} = x^2 + y$
- C. $\frac{dy}{dx} = 2x + 3$
- D. $\frac{dy}{dx} = 3y - 2$
- E. $\frac{dy}{dx} = \cos y$

11) A particle moves along the x -axis in such a way that its position at time t for $t \geq 0$ is given by $x = \frac{1}{3}t^3 - 3t^2 + 8t$.

- (a) Show that at time $t = 0$, the particle is moving to the right.
- (b) Find all values of t for which the particle is moving to the left.
- (c) What is the position of the particle at time $t = 3$?
- (d) When $t = 3$, what is the total distance the particle has traveled?

12)

Given the function defined by $y = x + \sin x$ for all x such that $-\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$.

- (a) Find the coordinates of all maximum and minimum points on the given interval. Justify your answers.
- (b) Find the coordinates of all points of inflection on the given interval. Justify your answers.