

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 $f(x) = \int_0^{x^2} e^{t^2+t} dt$. Find $f'(x)$.

- (A) e^{x^2+2x} (B) $2x e^{x^2(x^2+1)}$ (C) $e^{x^4+x^2}$ (D) $2e^{(x^2+x)}$ (E) $2x e^{x^2+2x}$

2) What is the average value of $y = x^2\sqrt{x^3+1}$ on the interval $[0, 2]$?

3) What are all values of k for which $\int_{-3}^k x^2 dx = 0$?

4) Let $F(x)$ be an antiderivative of $\frac{(\ln x)^3}{x}$. If $F(1) = 0$, then $F(9) =$

5) $\int x \cos x \, dx =$

6) If $\frac{dy}{dx} = \sqrt{1-y^2}$, then $\frac{d^2y}{dx^2} =$

7) Use implicit differentiation to find $\frac{dy}{dx}$ for the equation $4y - e^{xy} = 7$.

- (A) $-\frac{1}{4}e^{xy}$ (B) $\frac{y}{x + 4e^{-xy}}$ (C) $-\frac{ye^{xy}}{xe^{xy} - 4}$ (D) $-\frac{y}{4}e^{xy} + 7$ (E) $\frac{7 - ye^{xy}}{4 + xe^{xy}}$

8) Which of following is equal to $\int_1^3 (2x^2 - 5)^3 x dx$?

- (A) $\frac{1}{4} \int_1^3 u^3 du$ (B) $\frac{1}{4} \int_{-3}^{13} u^3 du$ (C) $\int_{-3}^{13} u^3 du$ (D) $4 \int_1^3 u^3 du$ (E) $4 \int_{-3}^{13} u^3 du$

9) Use partial fractions to evaluate $\int_3^5 \frac{4x - 9}{2x^2 - 9x + 10} dx$

- (A) $\ln 3 + \ln 5$ (B) $2 \ln 3 + \ln 5$ (C) $\ln 3 + 2 \ln 5$ (D) $\ln 5 - \ln 3$ (E) $2 \ln 5 - \ln 3$

10) The graph of $f(x) = x^3 + x^2$ has a point of inflection at

- (A) $x = \frac{1}{3}$ (B) $x = -\frac{1}{3}$ (C) $x = -\frac{2}{3}$ (D) $x = \frac{2}{27}$ (E) $x = 0$

11) A particle starts at the point $(5,0)$ at $t = 0$ and moves along the x -axis in such a way that at time $t > 0$ its velocity $v(t)$ is given by $v(t) = \frac{t}{1+t^2}$.

- (a) Determine the maximum velocity attained by the particle. Justify your answer.
- (b) Determine the position of the particle at $t = 6$.
- (c) Find the limiting value of the velocity as t increases without bound.
- (d) Does the particle ever pass the point $(500,0)$? Explain.

12)

The graph of a function f consists of a semicircle and two line segments as shown below. Let g be the function given by $\int_0^x f(t) dt$

- Find $g(3)$.
- Find all values of x on the open interval $(-2,5)$ at which g has a relative maximum. Justify your answer.
- Write an equation for the line tangent to the graph of g at $x = 3$.
- Find the x -coordinate of each point of inflection of the graph of g on the open interval $(-2,5)$. Justify your answer.



