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.*

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1)

Let $f(x) = \displaystyle\int_0^{x^2} e^{t^2+t} \, dt$. 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) $2x\, e^{x^2+2x}$

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2)

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

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3)

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

4)

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

5)

$\displaystyle \int x \cos x \, dx =$

6)

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

7)

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

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

8)

Which of following is equal to $\displaystyle\int_{1}^{3} (2x^2 - 5)^3\, x\, dx$?

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

9)

Use partial fractions to evaluate $\displaystyle\int_{3}^{5} \dfrac{4x - 9}{2x^2 - 9x + 10}\, dx$

(A) $\ln 3 + \ln 5$ (B) $2\ln 3 + \ln 5$ (C) $\ln 3 + 2\ln 5$ (D) $\ln 5 - \ln 3$ (E) $2\ln 5 - \ln 3$
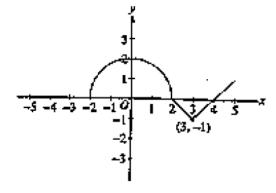
10) The graph of $f(x) = x^3 + x^2$ has a point of inflection at

(A) $x = \dfrac{1}{3}$ (B) $x = -\dfrac{1}{3}$ (C) $x = -\dfrac{2}{3}$ (D) $x = \dfrac{2}{27}$ (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 $v(t) = \dfrac{t}{1+t^2}$.

(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 $\int\limits_{0}^{x} f(t)dt$

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

(3,-1)