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) If a function is given by $f(x) = \frac{x+3}{x^2-1}$, what is the instantaneous rate of change of the function at $x = 3$?

A. $\frac{7}{16}$

B. $-\frac{7}{16}$

C. $\frac{11}{16}$

D. $-\frac{11}{16}$

2) If $7 = xy - e^{xy}$, then $\frac{dy}{dx} =$

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

3) $\int_0^1 \sin^{-1}(x)dx =$

(A) 0 (B) $\frac{\pi+2}{2}$ (C) $\frac{\pi-2}{2}$ (D) $\frac{\pi}{2}$

4) $\int_0^{\frac{\pi}{2}} \sin^5 x \cos x dx =$

(A) $\frac{1}{6}$ (B) $-\frac{1}{6}$ (C) 0 (D) −6

5) The function f is given by $f(x) = 2x^4 - 3x^2 + 1$. On which of the following intervals is f decreasing?

(A) $\left(-\frac{\sqrt{3}}{2}, \frac{\sqrt{3}}{2}\right)$

(B) $\left(-\infty, -\frac{\sqrt{3}}{2}\right)$

(C) $\left(0, \frac{\sqrt{3}}{2}\right)$

(D) $\left(-\infty, -\frac{\sqrt{3}}{2}\right)$ *and on* $\left(0, \frac{\sqrt{3}}{2}\right)$

6) The graph of $f(x) = \sqrt{11 + x^2}$ has a point of inflection at

(A) $(0, \sqrt{11})$

(B) $(-\sqrt{11}, 0)$

(C) $(0, -\sqrt{11})$

(D) There is no point of inflection.

7) The tangent line to the curve $y = x^3 - 4x + 8$ at the point $(2, 8)$ has an x-intercept at

(A) $(-1, 0)$ (B) $(1, 0)$ (C) $(0, -8)$ (D) $(0, 8)$

8) Over the interval $0 \le t \le 5$, the position of a particle is given by $s(t) = t^4 - t^3 - t + 1$. What is the minimum velocity of the particle on the interval $0 \le t \le 5$?

A. $t = \frac{1}{2}$

B. $t = \frac{1}{4}$

C. $t = 1$

D. $t = -1$

9) $\int \frac{x - 18}{(x + 3)(x - 4)} dx =$

(A) $\int \frac{5dx}{(x + 3)(x - 4)}$

(B) $\int \frac{dx}{(x + 3)(x - 4)}$

(C) $\int \frac{15dx}{(x + 3)} - \int \frac{14dx}{(x - 4)}$

(D) $\int \frac{3dx}{(x + 3)} - \int \frac{2dx}{(x - 4)}$

10) The volume of the solid that results when the area between the curve $y = e^x$ and the line $y = 0$, from $x = 1$ to $x = 2$, is revolved around the x-axis is

(A) $2\pi(e^4 - e^2)$ (B) $\frac{\pi}{2}(e^4 - e^2)$ (C) $\frac{\pi}{2}(e^2 - e)$ (D) $2\pi(e^2 - e)$

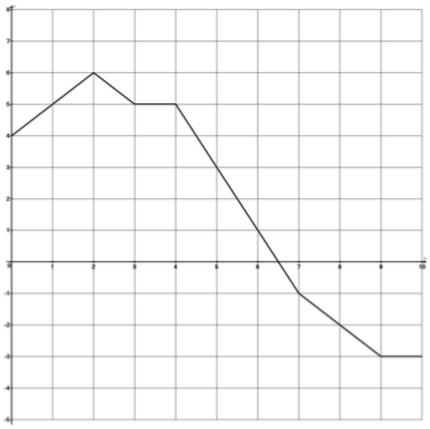
11) Let f be the function given by $f(x) = 2x^4 - 4x^2 + 1$.

(a) Find an equation of the line tangent to the graph at $(-2, 17)$. Verify your answer.

(b) Find the x and y-coordinates of the relative maxima and relative minima.

(c) Find the x-coordinates of the points of inflection. Verify your answer.

12)



Jerry runs on a straight track starting at time $t = 0$ seconds and ending at time $t = 10$ seconds. During the time interval $0 \le t \le 10$, his velocity $v(t)$ in meters per second is modeled by the piecewise-linear function whose graph is shown above.

a. Find Jerry's acceleration at time $t = 4.5$ seconds. Indicate units of measure.

b. Using correct units, explain the meaning of $\int_0^{10} v(t)dt$ and how (if at all) it differs from $\int_0^{10} |v(t)|dt$.

c. At what time (if any) did Jerry change direction? Explain your reasoning.

d. Jeff runs on the same track, starting from the same starting line, with a velocity given by $f(t) = 5 - \frac{x^2}{25}$. At time $t = 10$ seconds, who is closer to the starting line: Jerry or Jeff?