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 $\frac{dy}{dx} = (x+3)e^{-2y}$, then which of the following is a possible expression for y?

(A) $\frac{1}{2}\ln(x^2+6x+5)$

(B) $\ln(x^2+6x-4)$

(C) $\frac{1}{2}\ln(x^2+6x)-3$

(D) $\frac{1}{2}\ln\left(\frac{1}{4}x^2+\frac{3}{2}x\right)$

(E) $\frac{1}{2}\ln(x^2+3x)$

2) If $\frac{dy}{dx} = \sin x \cos^2 x$ and if $y=0$ when $x=\frac{\pi}{2}$, what is the value of y when $x=0$?

3) Find the values of x for which the graph of $y = xe^x$ is concave upward.

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

4) If $f(x) = g(x) + 7$ for $3 \le x \le 5$, then $\int_3^5 [f(x) + g(x)]\,dx =$

(A) $2\int_3^5 g(x)\,dx + 7$

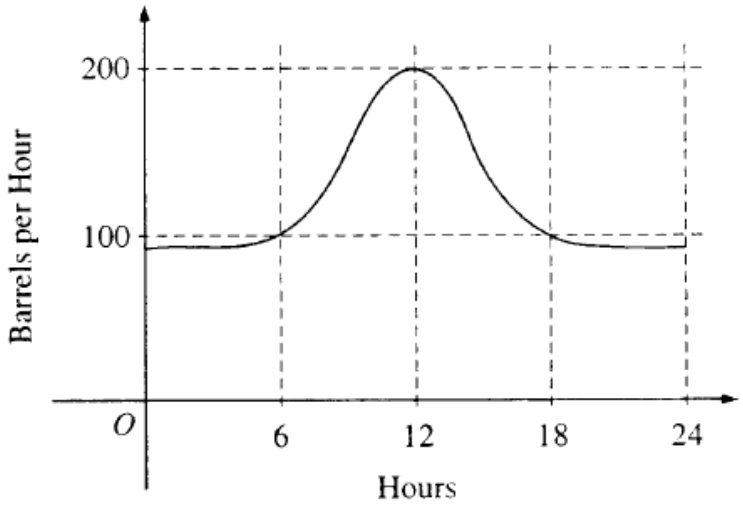
(B) $2\int_3^5 g(x)\,dx + 14$

(C) $2\int_3^5 g(x)\,dx + 28$

(D) $\int_3^5 g(x)\,dx + 7$

(E) $\int_3^5 g(x)\,dx + 14$

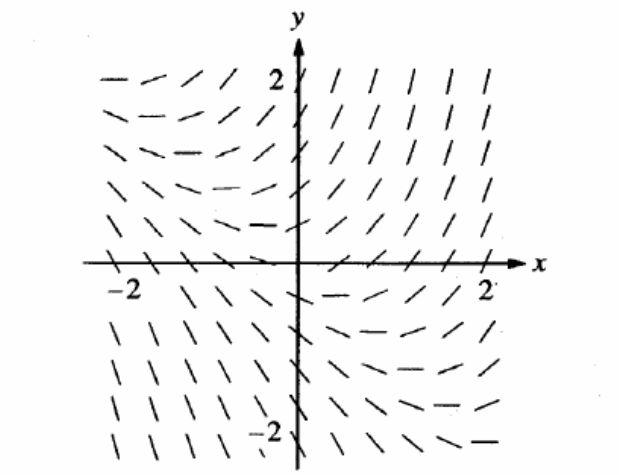
5)



The flow of oil, in barrels per hour, through a pipeline on July 9 is given by the graph shown above. Of the following, which best approximates the total number of barrels of oil that passed through the pipeline that day?

(A) 500 (B) 600 (C) 2,400 (D) 3,000 (E) 4,800

6)



Shown above is a slope field for which of the following differential equations?

(A) $\frac{dy}{dx} = 1 + x$ (B) $\frac{dy}{dx} = x^2$ (C) $\frac{dy}{dx} = x + y$ (D) $\frac{dy}{dx} = \frac{x}{y}$ (E) $\frac{dy}{dx} = \ln y$

7)

$$\int_1^e \left(\frac{x^2 - 1}{x} \right) dx =$$

8) Find the average rate of change of y with respect to x on the closed interval $[0, 3]$ if $\frac{dy}{dx} = \frac{x}{x^2 + 1}$.

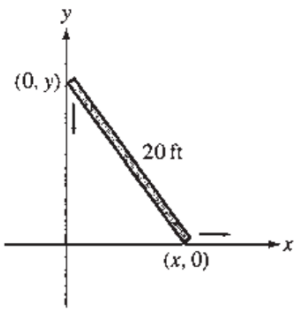
(A) $\frac{1}{6} \ln 10$ (B) $\frac{1}{6} \ln 3$ (C) $\frac{1}{2} \ln 10$ (D) $\frac{1}{10}$ (E) $\frac{3}{10}$

9)

t (sec)	0	2	4	6
$a(t)$ (ft/sec^2)	5	2	8	3

The data for the acceleration $a(t)$ of a car from 0 to 6 seconds are given in the table above. If the velocity at $t = 0$ is 11 feet per second, the approximate value of the velocity at $t = 6$, computed using a left-hand Riemann sum with three subintervals of equal length, is

10)



A 15-foot ladder is leaning against a building as shown, so that the top of the ladder is at $(0, y)$ and the bottom is at $(x, 0)$. The ladder is falling because the ground is slippery; assume that $\frac{dy}{dt} = -12$ feet per second at the instant when $x = 9$ feet. Find $\frac{dx}{dt}$ at this instant.

(A) 6 feet per second

(B) 9 feet per second

(C) 12 feet per second

(D) 16 feet per second

(E) 20 feet per second

11) Let $y = 2e^{\cos x}$.

(a) Calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

(b) If x and y both vary with time in such a way that y increases at a steady rate of 5 units per second, at what rate is x changing when $x = \frac{\pi}{2}$?

12) Given the curve $x + xy + 2y^2 = 6$.

(a) Find an expression for the slope of the curve at any point (x, y) on the curve.

(b) Write an equation for the line tangent to the curve at the point $(2,1)$.

(c) Find the coordinates of all other points on this curve with slope equal to the slope at $(2,1)$.