

Name _____

No calculators allowed!

1. (8 points) If $g(t) = 5t^2 + 4t - 8$, then

$$g'(t) =$$

2. (8 points) If $h(x) = 2^x + \ln(x)$, then

$$h'(x) =$$

3. (8 points) If $y = \frac{1}{3\sqrt{x}}$, then

$$\frac{dy}{dx} =$$

4. (8 points) If $w = (t^2 + 1)^5$, then

$$\frac{dw}{dt} =$$

5. (8 points) If $P(t) = t^2 e^t$, then

$$P'(t) =$$

6. (8 points) If $y = \frac{t^2 + 1}{t^3 + 5}$, then

$$\frac{dy}{dt} =$$

7. (8 points) Ralph Howard purchased some guppies for his new fish tank. They reproduced many times and Ralph noted that the total number of guppies could be approximated by the function $g(t) = t^2 + 20$, where t represents the number of months since his original purchase. Precisely five months after his original purchase, the total number of guppies in his fish tank are increasing by

- (a) 5 guppies per month
- (b) 10 guppies per month
- (c) 20 guppies per month
- (d) 25 guppies per month
- (e) 30 guppies per month
- (f) 45 guppies per month

8. (8 points) If $f(x) = \ln(x + 3)$, then what is the value of $f'(0)$?

- (a) $\ln(3)$
- (b) $\frac{1}{\ln(3)}$
- (c) 3
- (d) $\frac{1}{3}$
- (e) e^3
- (f) $\frac{1}{e^3}$

9. (6 points) On the graph of $y = 3x^2 - 200$, what is the slope of the curve at $x = 10$?

(a) 10

(b) 20

(c) 30

(d) 40

(e) 50

(f) 60

10. (8 points) Which of the following lines is tangent to the graph of $f(x) = e^{2x-6}$ at $x = 3$?

(a) $y = x$

(b) $y = x - 5$

(c) $y = x + 3$

(d) $y = 2x$

(e) $y = 2x - 5$

(f) $y = 2x + 3$

11. After a weekend away from school, a student carrying a flu virus returned to an isolated college campus. The virus spread and the total number of infected students t days after the student returned to campus can be approximated by $f(t)$.
- (a) (6 points) Suppose that $f(8) \approx 240$. Which of the following choices best describes what this means in practical terms?
- (a) Eight days after the student returned to campus, there were a total of 240 students infected with the flu virus.
 - (b) Eight days after the student returned to campus, the number of infected students was increasing by 240 students per day.
 - (c) During the first 8 days after the student returned to campus, the number of infected students was increasing at an average rate of 240 students per day.
 - (d) The flu lasted for 8 days. A total of 240 students were infected each day.
 - (e) Every 8 days, 240 more students came down with the flu.
- (b) (6 points) Suppose that $f'(8) \approx 10$. Which of the following choices best describes what this means in practical terms?
- (a) Eight days after the student returned to campus, there were a total of 10 students infected with the flu virus.
 - (b) Eight days after the student returned to campus, the number of infected students was increasing by 10 students per day.
 - (c) During the first 8 days after the student returned to campus, the number of infected students was increasing at an average rate of 10 students per day.
 - (d) The flu lasted for 8 days. A total of 10 students were infected each day.
 - (e) Every 8 days, 10 more students came down with the flu.
- (c) (6 points) Given that $f(8) \approx 240$ and $f'(8) \approx 10$, approximate the total number of students that were infected with the flu virus 9 days after this student returned to campus?
- (a) 90
 - (b) 250
 - (c) 270
 - (d) 320
 - (e) 330

12. (4 points) If $f(x) = \ln(\sqrt{e^{4x}})$, then

$$f'(x) =$$