

Name _____

Seat # _____

- Do not open this test booklet until told to do so.
- Turn off all cell phones.
- For multiple-choice questions, precisely one answer is correct. Circle this correct answer.
- For all other questions, you must show sufficient work to justify your answer.
- No calculators allowed!
- Show your Student ID when you turn in your test.

#1 (8 points) _____

#2 (8 points) _____

#3 (8 points) _____

#4 (8 points) _____

#5 (8 points) _____

#6 (8 points) _____

#7 (8 points) _____

#8 (8 points) _____

#9 (8 points) _____

#10 (8 points) _____

#11 (8 points) _____

#12 (4 points) _____

#13 (8 points) _____

Total (100 points) _____

1. (8 points) If $g(t) = 10t^3 - 5t + 10$, then

$$g'(t) =$$

2. (8 points) If $h(x) = (1.5)^x - \ln(x)$, then

$$h'(x) =$$

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

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

4. (8 points) If $w = (t^5 + 2t)^3$, then

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

5. (8 points) If $P(t) = 4t^2e^t$, then

$$P'(t) =$$

6. (8 points) If $y = \frac{t^3 + 10}{t + 5}$, then

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

7. (8 points) Ralph Howard purchased some goldfish for his new fish tank. They reproduced many times and Ralph noted that the total number of goldfish could be approximated by the function $g(t) = t^2 + 30$, where t represents the number of months since his original purchase. Precisely ten months after his original purchase, the total number of goldfish in his fish tank are increasing by

- (a) 5 goldfish per month
- (b) 20 goldfish per month
- (c) 25 goldfish per month
- (d) 30 goldfish per month
- (e) 45 goldfish per month
- (f) 50 goldfish per month

8. (8 points) If $f(x) = \ln(4x)$, then what is the value of $f'(2)$?

- (a) $\ln(2)$
- (b) $\frac{1}{\ln(2)}$
- (c) $\ln(8)$
- (d) $\frac{1}{\ln(8)}$
- (e) $\frac{1}{2}$
- (f) $\frac{1}{4}$
- (g) e^8
- (h) $\frac{1}{e^8}$

9. (8 points) On the graph of $y = x^2 + 30x + 2$, 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) Find the equation of the line which is tangent to the graph of $f(x) = 10e^x + 2e^{-x}$ at $x = 0$? Write your answer in simplest form.

11. (8 points) Let $C(q)$ represent the total cost in dollars of producing q items. Suppose $C(20) = 1500$ and $C'(20) = 30$. Estimate the total cost of producing 22 items.

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

$f'(x) =$

13. (8 points) Sketch a graph of $f(x) = x^3 - 3x$. Be sure to include x and y coordinates for all the important points on your graph.