• 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.