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 $P(t) = t^2e^t$, 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 \( f(x) = \ln\left(\sqrt{e^{4x}}\right) \), then

\[
f'(x) =
\]