1. (4 points each) Determine the given limit.

(a) \( \lim_{x \to 2} \frac{x^2 - 5x + 6}{x - 2} = \) \\

(b) \( \lim_{x \to 2^+} \frac{x^2 - 5x + 5}{x - 2} = \) \\

(c) \( \lim_{x \to 2^-} \frac{|x^2 - 5x + 6|}{x - 2} = \) \\

(d) \( \lim_{x \to \infty} \frac{3x^2 - 7x + 1}{x^3 - 1} = \) \\

(e) \( \lim_{x \to 0} \frac{21^x - 1}{x} = \)
2. (5 points each) Determine the derivative function.

(a) \( f(x) = \sqrt{x^2 + e^{2x}} \)

(b) \( f(x) = (4x - 7)^3(7x^2 + 4)^4 \)

(c) \( f(x) = \frac{3x}{x + 5 \tan 3x} \)

(d) \( f(x) = \sin^3(4x + 1) \)

(e) \( f(x) = (1 - x^2)^{10} + 10^{1-x^2} \)
(f) \( f(x) = x^2 \ln (1 + x^2) \)

(g) \( f(x) = \ln \left( \frac{e^{2x}(3x + 7)^2}{(x + 2 \cos(x))^2} \right) \)

(h) \( f(x) = x^{3x} \)

3. (5 points) Determine the inverse of

\[
f(x) = 4 + 7e^{-x/2}.
\]
4. (10 pts) The length of a rectangle is increasing by 2 ft/sec and the width is decreasing by 3 ft/sec. At what rate is the area changing when the length is 10 ft and the width is 8 ft?

5. (10 pts) Determine the equation of the tangent line to the curve

\[(x + 2y)^3 + (2x + y)^3 + 2xy = -2\]

at the point \((-1, 1)\).
6. (10 pts) Use linear approximation to estimate the value of $\sqrt{99.6}$.

7. (5 pts) State the definition of the derivative of a function $f(x)$ at a value $x = a$. Use limits.