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

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

(b) $\lim_{x \to 2^+} \dfrac{x^2 - 5x + 5}{x - 2} =$ __________________

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

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

(e) $\lim_{x \to 0} \dfrac{21^x - 1}{x} =$ __________________

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) $f(x) = \dfrac{3x}{x + 5\tan 3x}$

(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.