Calculus I
Extra Practice, 1.1-1.3

1. Find the domain:

$$f(x) = \sqrt{x^2 - 6x}, \quad g(x) = \frac{x+2}{x^2-1}, \quad h(x) = \sqrt{\frac{x+2}{x^2-1}}$$

2. Rewrite each absolute value function as a piece-wise defined function.

$$f(x) = |x^2 - 1|, \quad g(x) = |3x - 5|, \quad h(x) = \left|\frac{x-1}{(x+2)(x+3)}\right|$$

3. Find the limit algebraically, if it exists:

$$\lim_{x \to 2^+} \frac{|x-2|}{x-2}, \quad \lim_{t \to 2} \frac{t^2+t-6}{t^2-4}, \quad \lim_{t \to 0} \left(\frac{1}{t\sqrt{1+t}} - \frac{1}{t} \right)$$

4. Find the point of intersection between the lines $y = 2x - 5$ and $y = -3x + 4$.

5. Find the point on $y = -2x + 5$ that is closest to the origin.

6. Rewrite the following using long division. Before doing so, you should check to see if there will be a remainder.

$$\frac{x^3 + 3x^2 + 5x + 7}{x+1}, \quad \frac{x^2 - 22}{x-5}, \quad \frac{x^3 + 5x^2 + 9x + 9}{x+3}$$

7. Is $\dfrac{x^3 - 8}{x - 2} = x^2 + 2x + 4$? Discuss.

8. Find the limit algebraically, if it exists:

$$\lim_{x \to 1} \frac{x^3 - 1}{x^2 - 1}, \quad \lim_{h \to 0} \frac{(2+h)^3 - 8}{h}, \quad \lim_{t \to 3} \frac{9 - t}{3 - \sqrt{t}}$$

9. Let $p(x), q(x)$ be polynomials, and consider $\displaystyle\lim_{x \to a} \frac{p(x)}{q(x)}$

   (a) If the limit is "$\frac{0}{0}$", what can we conclude?

   (b) If the limit is "$\frac{0}{0}$", does $(x - a)$ factor out of both the numerator and denominator? Why (e.g., what is the general rule that is used)?

   (c) If the limit is "$\frac{K}{0}$", where $K \neq 0$, then what can we conclude?

   (d) If the limit is "$\frac{0}{K}$", where $K \neq 0$, then what can we conclude?