Exam #1 Review Key
Math 112, Sister Orme

Sec 2.1

1. *See the book.*

Sec 2.2

2. *Answers will vary*. Possible answers: $\lim_{x\to 0}\frac{(x+5)^2}{-x^2}$ or $\lim_{x\to 0}\frac{-1}{x^2}$.

3.

$$\lim_{x\to 0}\frac{\cos x}{x} = Undefined.$$

$$\lim_{x\to 2}\frac{x^2+x-6}{x^2-5x+6} = -5$$

$$\lim_{h\to 0}\frac{(h+2)^2-4}{h} = 4$$

$$\lim_{x\to 3}\frac{\frac{1}{x}-\frac{1}{3}}{(x-3)} = \frac{-1}{9}$$

$$\lim_{x\to 7}\frac{(x-7)}{\sqrt{x+2}-3} = 6$$

$$\lim_{x\to 3^+}\frac{(x^2-3x-4)}{(x^2-9)} = -\infty$$

$$\lim_{x\to 0}\frac{2x}{\sin(5x)} = \frac{2}{5}$$

$$\lim_{x\to 2}\frac{(x-2)}{\sqrt{x}-\sqrt{2}} = 2\sqrt{2}$$

$$\lim_{x\to 0^+}\frac{1}{xln(x)} = -\infty$$

$$\lim_{x\to 0}\frac{(1-x)e^x-1}{x^2} = -\frac{1}{2}$$

4.

$\lim_{x\to -3} f(x) = \infty$

$$\lim_{x\to -1} f(x) = 1$$

$$\lim_{x\to 1^+} f(x) = 3$$

$$\lim_{x\to 3} f(x) = DNE$$

$$\lim_{x\to 4} f(x) = 5$$

5. *See the book.*

Sec 2.3
6. $5.02 > x > 4.98$ so $\delta = 0.02$.
7. *See the book.*

Sec 2.4
8. *See the book.*

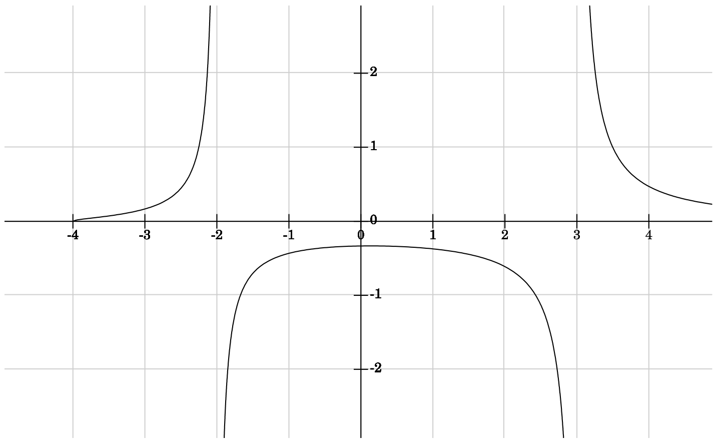
Sec 2.5
10.
Points and Types of Discontinuity:
x= -4 (Jump), 1 (Jump), 5 (Asymptotic), 9 (Removable/Hole).
Values continuous from the left: $x = -4$. The function exists at the point (-4,10) since the point is solid. It does not, however, exist at the point (-4, 10) since that point is a hole.
Values continuous from the right: $x = 1$. The function exists at the point (1,1) since the point is solid. It does not, however, exist at the point (1, -1/2) since that point is a hole.
Intervals of Continuity: $(-\infty, -4) \cup [-4,1] \cup (1,5) \cup (5,9) \cup \ (9, \infty)$.

11. *Answers will vary.* One possible answer: $f(x) = \frac{\sin(x)}{x}$ because there is a hole at $(0,1)$.

12. The function has an asymptotic discontinuity because
$$\lim_{x\to\pi} \frac{x}{\sin x} = \frac{\pi}{0} = Und.$$

13. The function $f(x)$ must exist at $x = 1$. The $\lim_{x\to 1} f(x)$ must exist. The $\lim_{x\to 1} f(x) = f(1)$, or in other words, you must get the same answer when you plug in 1 for x as you do when you find the limit as the function approaches $x = 1$.

14.
Points and Types of Discontinuity: x= -2 (Asymptotic), 3 (Asymptotic).
Values continuous from the left: none. The function does not exist at the point $x = -2$, even though the limit does. The third rule of continuity fails.
Values continuous from the right: none. The function does not exist at the point $x = 3$, even though the limit does. The third rule of continuity fails.
Intervals of Continuity: $(-\infty, 2) \cup (3, \infty)$.
Below is a graph of $f(x) = \frac{\sqrt{x+4}}{(x+2)(x-3)}$. You didn't have to graph it, but it might help to see it.



Sec 2.6

9. *See the book.*