1. Write an equation of the line that passes through $(-3,7)$ and is perpendicular to the line with equation $y-2x=10$.
2. Simplify each of the following:
   a. $\dfrac{\dfrac{1}{2+h}-\dfrac{1}{2}}{h}$
   b. $\dfrac{x^{-2/5}\sqrt{4x}}{\sqrt[3]{x}}$
3. Solve the inequality $\dfrac{x^2-9}{x-1}\le 0$; express the domain in interval notation.
4. For the function $f(x)=3x-6$, find $\dfrac{f(x+h)-f(x)}{h}$.
5. Determine each of the following (if they exist) :
   a. $\sin(0)$
   b. $\cos(0)$
   c. $\sin^{-1}(4)$
   d. $\tan^{-1}(1)$
6. Write $\sin(\arctan x)$ as an algebraic function that does not involve a trigonometric function or inverse trigonometric function.
7. Sketch a graph of each of the following. Label any important points or features.
   a. $\sin x$
   b. $\sqrt{x-3}$
8. Give the formal definition of the limit statement $\lim\limits_{x\to c} f(x)=L$. Illustrate the definition with a graph.
9. Evaluate each of the following, if they exist:
   a. $\lim\limits_{x\to 1}\left(\dfrac{1+3x}{1+4x^2+3x^4}\right)^3$, state which limit laws were used.
   b. $\lim\limits_{x\to\infty} e^{-x}\tan^{-1}x$
   c. $\lim\limits_{x\to 2}\dfrac{x^2+2x-8}{x^4-16}$
   d. $\lim\limits_{x\to 3}\dfrac{\dfrac{1}{x-3}-\dfrac{1}{x}}{x-3}$
   e. $\lim\limits_{x\to 8^-}\dfrac{|x-8|}{x-8}$
   f. $\lim\limits_{x\to\infty}\dfrac{\sqrt{x}}{1-\sqrt{x}}$

g. $\lim_{x\to 0}\dfrac{3x}{\sin 2x}$

h. $\lim_{x\to 3} f(x)$ where $f(x)=\begin{cases}2(x+1) & \text{if } x<3\\ 4 & \text{if } x=3\\ x^2-1 & \text{if } x>3\end{cases}$

10. Use the Intermediate Value Theorem to show that $x^4+x-3=0$ on $[1,2]$.

11. Use the definition of continuity to find constant *c* to such that $f(x)=\begin{cases}x^2-c^2 & \text{if } x<4\\ cx+20 & \text{if } x\geq 4\end{cases}$ is continuous at $x=4$.

12. Describe the interval(s) on which the function $f(x)=\begin{cases}\dfrac{x^2-1}{x-1} & \text{if } x<1\\ 0 & \text{if } x=1\\ 3x-1 & \text{if } x>1\end{cases}$ is continuous. At any point where *f* fails to be continuous use limits to determine the type of discontinuity.

13. Find the roots, discontinuities and horizontal and vertical asymptotes of the following functions. Support your answers by explicitly computing any relevant limits.

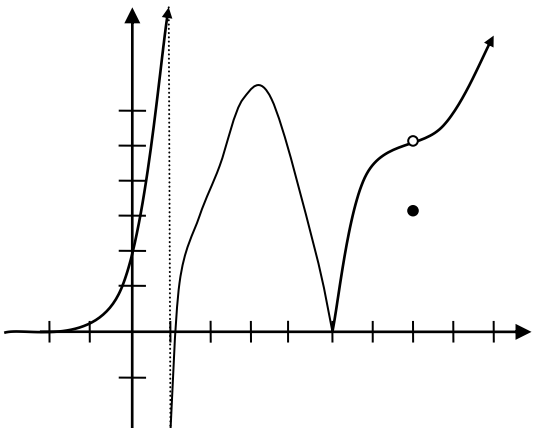
a. $f(x)=\dfrac{(x+1)(x-2)}{(x-2)^2(x+2)}$

b. $f(x)=\dfrac{4^x-6(2^x)+5}{1-2^x}$

14. Sketch the graph of an example of a function *f* that satisfies the following conditions.

$$\lim_{x\to 0^+} f(x)=-2 \qquad \lim_{x\to 0^-} f(x)=1 \qquad f(0)=-1$$
$$\lim_{x\to 2^+} f(x)=-\infty \qquad \lim_{x\to 2^-} f(x)=+\infty$$
$$\lim_{x\to \infty} f(x)=3 \qquad \lim_{x\to -\infty} f(x)=4$$

15. Using the graph of $f(x)$, answer each of the following:



a. $\lim_{x \to 7} f(x)$

b. $\lim_{x \to 1^-} f(x)$

c. Where is $f(x)$ not continuous?

Topics:

- ✓ Review algebra and trig from chapter 0:
  - Lines
  - Inverse functions
  - Trig functions /Inverse Trig functions
  - Exponential and Logarithmic Functions
- ✓ Limits:
  - Graphical, numerical and algebraic techniques for finding limits; be sure you know how to use limit laws (think about the five problems we did in class asking you to state the laws used).
  - Infinite limits; when *y* becomes arbitrarily large in magnitude as *x* approaches *a*.
  - End behavior; what happens to *y* as *x* becomes arbitrarily large in magnitude.
  - Continuity

For additional problems, check out the review problems for Chapters 0 and 1. Note the questions above are simply a sample of questions possible for the exam; it is possible that other types of questions may appear on your exam.