1. Find an equation of a line who passes through the points $(-4,2)$ and $(2,7)$.
2. Solve the equation for x: $x(x-1)=12$
3. Solve the equation for x: $x^2+6x+8<0$
4. Express the domain of the following function in interval notation: $f(x)=\sqrt{\dfrac{x-2}{x+2}}$
5. If $f(x)=x-x^2$, find $\dfrac{f(2+h)-f(2)}{h}$ and simplify.
6. Find $\cos(\arcsin x)$
7. Suppose $\cos\theta=-\dfrac{3}{5}$ for $\dfrac{\pi}{2}<\theta<\pi$, find
   a. $\tan\theta$
   b. $\sin(2\theta)$
8. Give the vertical and horizontal asymptotes of $f(x)=\dfrac{x^2-9}{x^2-x-6}$.

9. Using the Basic Properties of Limits, evaluate the following limits:
   a. $\lim\limits_{x\to 3}\dfrac{x^2+4x-21}{x-3}$
   b. $\lim\limits_{x\to 1^+}\sqrt{\dfrac{x^2+2x-3}{x-1}}$
   c. $\lim\limits_{x\to -3}\dfrac{2-\sqrt{x^2-5}}{x+3}$
   d. $\lim\limits_{x\to 5^-}\dfrac{|x-5|}{x-5}$
   e. $\lim\limits_{x\to\infty}\dfrac{3x^2-2x+1}{(x-2)^2}$
   f. $\lim\limits_{x\to 2} f(x)$, where $f(x)=\begin{cases} 3-2x & if\quad x<2 \\ 2 & if\quad x=2 \\ x^2-5 & if\quad x>2 \end{cases}$

10. Explain why $f(x)=x^3+2x+5$ has a zero in the interval $-2\le x\le 0$.

11. Let $f(x)=\begin{cases} ax+3 & if\quad x>5 \\ 8 & if\quad x=5 \\ x^2+bx+1 & if\quad x<5 \end{cases}$, find a and b such that f is continuous at $x=5$. Use the definition of continuity in your answer.

12. Sketch a function that satisfies the following conditions:
    $f(0)=1$ $\quad\lim\limits_{x\to\pm\infty} f(x)=0$, $\quad\lim\limits_{x\to 2^-} f(x)=\infty$ $\quad\lim\limits_{x\to 2^+} f(x)=\infty$

13. Explain why or why not. Determine whether the following statements are true and give an explanation or counterexample.
    a. The rational function $\frac{x-1}{x^2-1}$ has vertical asymptotes at $x=-1$ and $x=1$.
    b. The value of $\lim_{x\to a} f(x)$, if it exists is found by calculating $f(a)$.
    c. If $\lim_{x\to a} f(x)$ does not exist, then either $\lim_{x\to a} f(x)=+\infty$ or $\lim_{x\to a} f(x)=-\infty$.
    d. If $\lim_{x\to a} f(x)=+\infty$ or $\lim_{x\to a} f(x)=-\infty$, $\lim_{x\to a} f(x)$ does not exist.
    e. For linear functions, the slope of any secant line always equals the slope of any tangent line.

Limit Laws

Suppose that k is a constant and the limits $\lim_{x\to c} f(x)$ and $\lim_{x\to c} g(x)$ exist. Then

1. Constant Multiple: $\lim_{x\to c} kf(x) = k\lim_{x\to c} f(x)$
2. Sum/Difference Rule: $\lim_{x\to c}\left[f(x)\pm g(x)\right] = \lim_{x\to c} f(x) \pm \lim_{x\to c} g(x)$
3. Product rule: $\lim_{x\to c}\left[f(x)\cdot g(x)\right] = \lim_{x\to c} f(x)\cdot \lim_{x\to c} g(x)$
4. Quotient rule: $\lim_{x\to c}\left[\frac{f(x)}{g(x)}\right] = \frac{\lim_{x\to c} f(x)}{\lim_{x\to c} g(x)}$ if $\lim_{x\to a} g(x)\neq 0$
5. Composition Rule: $\lim_{x\to c} f\left(g(x)\right) = f\left(\lim_{x\to c} g(x)\right)$, if f is continuous at $\lim_{x\to c} g(x)$
6. Cancellation Theorem for Limits -- If $\lim_{x\to c} g(x)$ exists and f is a function that is equal to g for all x sufficiently close to c except possibly at c itself, then $\lim_{x\to c} f(x) = \lim_{x\to c} g(x)$
7. The Squeeze Theorem for Limits If $l(x)\le f(x)\le u(x)$ for all x sufficiently close to c, but not necessarily at $x=c$, and if $\lim_{x\to c} l(x) = L = \lim_{x\to c} u(x)$, then $\lim_{x\to c} f(x) = L$
8. Limits Whose Denominators Approach Zero from the Right or the Left
    a. If $\lim_{x\to c}\frac{f(x)}{g(x)}$ is of the form $\frac{1}{0^+}$, then $\lim_{x\to c}\frac{f(x)}{g(x)}=\infty$
    b. If $\lim_{x\to c}\frac{f(x)}{g(x)}$ is of the form $\frac{1}{0^-}$, then $\lim_{x\to c}\frac{f(x)}{g(x)}=-\infty$
9. Limits Whose Denominators Become Infinite Approach Zero
    a. If $\lim_{x\to\infty}\frac{f(x)}{g(x)}$ is of the form $\frac{1}{\infty}$, then $\lim_{x\to\infty}\frac{f(x)}{g(x)}=0$
    b. If $\lim_{x\to\infty}\frac{f(x)}{g(x)}$ is of the form $\frac{1}{-\infty}$, then $\lim_{x\to\infty}\frac{f(x)}{g(x)}=0$
10. $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}$

Similar results hold for limits at infinity and one-sided limits