Limits

Evaluate the following limits:

1) $\lim_{x\to 5} 3x+12 =$

2) $\lim_{x\to 5} \frac{x^2-4x+1}{x^2+3} =$

3) $\lim_{x\to 5} \frac{x^2-4x-5}{3x-15} =$

4) $\lim_{x\to 4} \frac{2x^2-3x-20}{3x^2-11x-4} =$

5) $\lim_{x\to 3} \frac{x^3-27}{x^2-9} =$

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

7) $\lim_{x\to 2^-} = \frac{5}{x-2} =$

8) $\lim_{x\to 2} = \frac{5}{x-2} =$

9) $\lim_{x\to \infty} = \frac{4x^2-8x+1}{9x^2+3x+5}$

10) $\lim_{x\to -\infty} = \frac{4x^2-8x+1}{9x^2+3x+5}$

11) $\lim_{x\to \infty} = \frac{x^2-11x+2}{8x^3+9x-7}$

12) $\lim_{x\to \infty} = \frac{x^2-11x+2}{8x^3+9x-7}$

13) $\lim_{x\to \infty} = \frac{x^4-2x+9}{6x^2+8x-5}$

14) $\lim_{x\to 0} \frac{3\cos x}{5} =$

15) $\lim_{x\to 0} \frac{3\sin x}{5} =$

16) $\lim_{x\to 0} \frac{3\sin x}{5x} =$

17) $\lim_{x\to 0} \frac{2\tan x}{7\sin x} =$

18) $\lim_{x\to 0}\dfrac{2\tan 3x}{7\sin 9x}=$

19) $\lim_{x\to 0}\dfrac{(x+3)^2-9}{x}=$

20) $\lim_{x\to 0}\dfrac{(4+x)^3-64}{x}=$

1) For what value of a is $f(x)$ continuous for all real numbers if

$$f(x)=\begin{cases} x^2-4x+1; & x<3 \\ x^2+ax+2; & x\geq 3 \end{cases}?$$

2) For what value of b is $f(x)$ continuous for all real numbers if

$$f(x)=\begin{cases} bx^2+6x-4; & x<2 \\ 3x^2+bx+1; & x\geq 2 \end{cases}?$$

3) For what value of a and b is $f(x)$ continuous for all real numbers if

$$f(x)=\begin{cases} ax^2+2bx-4; & x<1 \\ x^2+4ax+b; & 1\leq x\leq 2 \\ 3bx^2-6ax+12; & x>2 \end{cases}?$$

4) For what value of a and b is $f(x)$ continuous for all real numbers if

$$f(x)=\begin{cases} 3x^2-5ax+2b; & x<1 \\ -x^2+2ax+b; & 1\leq x\leq 2 \\ x^2-3ax+3b; & x>2 \end{cases}?$$

5) For what value of a and b is $f(x)$ continuous for all real numbers if

$$f(x)=\begin{cases} ax^3+3bx^2+5; & x<-1 \\ x^2-2ax+6b; & -1\leq x\leq 1 \\ x^3+ax+2b; & x>1 \end{cases}?$$

For each of the following, find (a) the slope of the secant line at the given points; and (b) the slope of the tangent line at x using the Definition of the Derivative:

1) $f(x) = x^2 + 10$ at $(2,14)$ and $(4,26)$

2) $f(x) = 3x^2 - 7$ at $(2,5)$ and $(6,41)$

3) $f(x) = x^2 + x + 9$ at $(1,11)$ and $(3,21)$

4) $f(x) = -x^2 + 6x$ at $(-2,-16)$ and $(4,40)$

5) $f(x) = x^3 + 4x^2 - 8$ at $(1,-3)$ and $(2,16)$

6) $f(x) = \frac{1}{x} + 7$ at $(1,8)$ and $(-1,6)$

7) $f(x) = \frac{1}{2x+5}$ at $\left(1,\frac{1}{7}\right)$ and $\left(4,\frac{1}{13}\right)$

8) $f(x) = \sqrt{x-5}$ at $(9,2)$ and $(14,3)$

9) $f(x) = \frac{1}{x} + \sqrt{x}$ at $(1,2)$ and $\left(4,\frac{9}{4}\right)$

10) $f(x) = \frac{1}{x^2}$ at $(1,1)$ and $\left(2,\frac{1}{4}\right)$