*LIMITS*

Find the indicated limit analytically.

**1.** $\lim_{x\to -3}(3x+2) = 3(-3)+2$
$= -9+2$
$= \boxed{-7}$

**2.** $\lim_{x\to 1}\frac{2x^2+x-3}{x-1} = \lim_{x\to 1}\frac{(2x+3)\cancel{(x-1)}}{\cancel{x-1}}$
$= \lim_{x\to 1}(2x+3)$
$= 2(1)+3 = \boxed{5}$

**3.** $\lim_{x\to 2}\frac{x^2-5x+6}{x-2} = \lim_{x\to 2}\frac{(x-3)\cancel{(x-2)}}{\cancel{x-2}}$
$= \lim_{x\to 2}(x-3)$
$= 2-3 = \boxed{-1}$

**4.** $\lim_{x\to 1}\frac{\sqrt{x+3}-2}{x-1}$

multiply by conjugate ☺

$\lim_{x\to 1}\frac{\sqrt{x+3}-2}{x-1}\cdot\frac{\sqrt{x+3}+2}{\sqrt{x+3}+2}$
$= \lim_{x\to 1}\frac{x+3-4}{(x-1)(\sqrt{x+3}+2)}$
$= \lim_{x\to 1}\frac{x-1}{(x-1)(\sqrt{x+3}+2)}$
$= \lim_{x\to 1}\frac{1}{\sqrt{x+3}+2}$
$= \frac{1}{\sqrt{1+3}+2}$
$= \frac{1}{\sqrt{4}+2}$
$= \frac{1}{2+2}$
$= \boxed{\frac{1}{4}}$

**5.** $\lim_{x\to 9}\frac{\sqrt{x}-3}{x-9}$

$\lim_{x\to 9}\frac{\sqrt{x}-3}{x-9}\cdot\frac{\sqrt{x}+3}{\sqrt{x}+3}$
$= \lim_{x\to 9}\frac{x-9}{(x-9)(\sqrt{x}+3)}$
$= \lim_{x\to 9}\frac{1}{\sqrt{x}+3}$
$= \frac{1}{\sqrt{9}+3}$
$= \frac{1}{3+3}$
$= \boxed{\frac{1}{6}}$

multiply by conjugate ☺

**6.** $\lim_{x\to\infty}\frac{5x^3-6x^2+3}{2x^3+7x^2-9} = \frac{5}{2}$

b/c degree of N = degree of D so, limit uses coefficients of leading terms

**7.** $\lim_{x\to\infty}\frac{9x^4+7x^2+8x}{4x^3+3x-12} = \infty$

b/c degree of N > degree of D so, limit is $\pm\infty$

**8.** $\lim_{x\to -\infty}\frac{3x^3-7x^2+5x+1}{7x^5+2x+5} = 0$

b/c degree of N < degree of D so, limit is zero

**9.** $\lim_{x\to 0}\frac{\sin 5x}{3x} = \lim_{x\to 0}\frac{5\cdot\sin 5x}{3\cdot 5x}$

multiply by $\frac{5}{5}$ ☺

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

↳ becomes 1

$= \frac{5}{3}\cdot 1$
$= \frac{5}{3}$