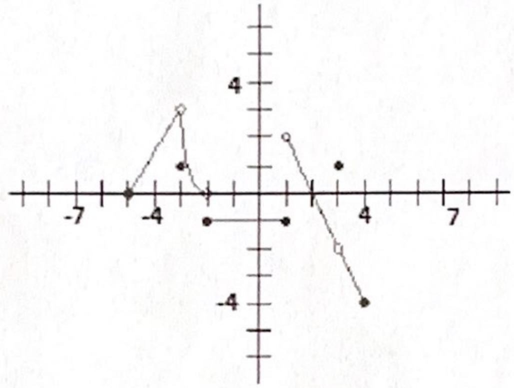
Your Name: Solution

ID #:

Note: for all the problems, identify the limit as a number, $-\infty$, ∞ or DNE (does not exist)

1. Refer to the graph below



Determine if the following limits exists:

$\lim_{x\to-3} f(x)$	$\lim_{x\to-2} f(x)$	$\lim_{x\to0} f(x)$	$\lim_{x\to1} f(x)$	$\lim_{x\to2} f(x)$	$\lim_{x\to3} f(x)$
1	DNE	-1	DNE	0	-2

2. (a) $\lim_{x\to c}(2x+5) = 2c+5$
   (b) $\lim_{t\to 6} 8(t-5)(t-7) = 8(6-5)(6-7) = -8$
   (c) $\lim_{x\to 2} \frac{x+2}{x^2-5x+6} = \infty$
   (d) $\lim_{x\to 0} \frac{x^3+(x+1)ln(x+3)}{x^3-4} = \frac{\ln 3}{-4}$
   (e) $\lim_{x\to 4} x^{x+1} = 4^5$
   (f) $\lim_{x\to -2} e^{x+1} = e^{-1}$
   (g) $\lim_{x\to \frac{\pi}{4}} sin(2x) = 1$
   (h) $\lim_{x\to \frac{\pi}{2}} csc(x) = 1$
   (i) $\lim_{x\to -5} \frac{x^2+3x-5}{x+7} = \frac{5}{2}$
   (j) $\lim_{x\to 2} \frac{e^x}{x+1} = \frac{e^2}{3}$
   (k) $\lim_{x\to 3} \frac{x^2-3}{\ln e^x} = 2$
   (l) $\lim_{x\to 0} \sqrt[3]{x^4+2x^3+8} = 2$
   (m) $\lim_{x\to 0}(x^2+1)^{2x-2} = 1$
   (n) $\lim_{x\to -1} e^{x^2} = e$
   (o) $\lim_{x\to \frac{\pi}{6}} \frac{tan(x)}{cos(2x)} = \frac{\tan\frac{\pi}{6}}{\cos\frac{\pi}{3}} = \frac{2\sqrt{3}}{3}$

3. (a) Find $\lim_{x\to 5} \frac{2x^2-7x-15}{x-5}$

$$= \lim_{x\to 5} \frac{(2x+3)\cancel{(x-5)}}{\cancel{x-5}}$$

$$= \lim_{x\to 5} (2x+3)$$

$$= \boxed{13}$$

   (b) Find $\lim_{x\to 1} \frac{x^3-1}{x-1}$

$$= \lim_{x\to 1} \frac{\cancel{(x-1)}(x^2+x+1)}{\cancel{(x-1)}}$$

$$= \lim_{x\to 1} (x^2+x+1)$$

$$= \boxed{3}$$

4. (a) Find $\lim_{x\to -2} \frac{x+2}{\sqrt{x+6}-2}$

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

$$= \lim_{x\to -2} \frac{(x+2)(\sqrt{x+6}+2)}{(x+6)-4}$$

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

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

$$= \boxed{4}$$

(b) Find $\lim_{x\to -1} \frac{\sqrt{x+10}-3}{x+1}$

$$= \lim_{x\to -1} \frac{(\sqrt{x+10}-3)(\sqrt{x+10}+3)}{(x+1)(\sqrt{x+10}+3)}$$

$$= \lim_{x\to -1} \frac{(x+10)-3^2}{(x+1)(\sqrt{x+10}+3)}$$

$$= \lim_{x\to -1} \frac{\cancel{x+1}}{\cancel{(x+1)}(\sqrt{x+10}+3)}$$

$$= \lim_{x\to -1} \frac{1}{\sqrt{x+10}+3}$$

$$= \boxed{\frac{1}{6}}$$

5. (a) Find $\lim_{x\to 0} \frac{x^2+8sin(x)}{x}$

$$= \lim_{x\to 0} \left(\frac{x^2}{x} + 8\frac{\sin x}{x}\right)$$

$$= \lim_{x\to 0} x + 8\lim_{x\to 0}\frac{\sin x}{x}$$

$$= 0 + 8\cdot 1$$

$$= \boxed{8}$$

(b) Find $\lim_{x\to 0} \frac{tan(6x^2)+sin^2(2x)}{x^2}$

$$= \lim_{x\to 0} \frac{\tan(6x^2)}{x^2} + \lim_{x\to 0}\frac{\sin^2(2x)}{x^2}$$

$$= 6\lim_{x\to 0} \frac{\tan(6x^2)}{6x^2} + \lim_{x\to 0}\left[\frac{\sin(2x)}{x}\right]^2$$

$$= 6 + \left[\lim_{x\to 0}\frac{\sin(2x)}{x}\right]^2$$

$$= 6 + \left[2\lim_{x\to 0}\frac{\sin(2x)}{2x}\right]^2$$

$$= 6 + 2^2 = \boxed{10}$$

6. (a) Find $\lim_{y\to 0}(\frac{6}{y^2+y} - \frac{6}{y})$

$$= \lim_{y\to 0}\left(\frac{6}{y(y+1)} - \frac{6(y+1)}{y(y+1)}\right)$$

$$= \lim_{y\to 0} \frac{6-6y-6}{y(y+1)}$$

$$= \lim_{y\to 0} \frac{-6\cancel{y}}{\cancel{y}(y+1)}$$

$$= \lim_{y\to 0} \frac{-6}{y+1}$$

$$= \boxed{-6}$$

(b) Find $\lim_{x\to 0} \frac{10sin(2x)}{1-cos(2x)}$

$$= \lim_{x\to 0} \frac{10\sin(2x)(1+\cos(2x))}{(1-\cos(2x))(1+\cos(2x))}$$

$$= \lim_{x\to 0} \frac{10\sin(2x)(1+\cos(2x))}{1-\cos^2(2x)}$$

$$= \lim_{x\to 0} \frac{10\sin(2x)(1+\cos(2x))}{\sin^2(2x)}$$

$$= \lim_{x\to 0} \frac{10(1+\cos(2x))}{\sin(2x)}$$

$$= \boxed{\infty}$$