Chapter 1

Find limit.

1) $\lim\limits_{x\to\frac{1}{2}} \dfrac{2x^2+5x-3}{-7x+2+6x^2} = \lim\limits_{x\to\frac{1}{2}} \dfrac{(2x-1)(x+3)}{(3x-2)(2x-1)} = \lim\limits_{x\to\frac{1}{2}} \dfrac{x+3}{3x-2} = \dfrac{3.5}{-.5}$ $\boxed{-7}$

$6x^2-7x+2$

2) $\lim\limits_{x\to 2} \dfrac{x^2-x-2}{(x-2)^2} = \lim\limits_{x\to 2} \dfrac{(x-2)(x+1)}{(x-2)^2}$

$= \lim\limits_{x\to 2} \dfrac{x+1}{x-2} = \boxed{\text{DNE}}$

Since $\lim\limits_{x\to 2^-} \dfrac{x+1}{x-2} = -\infty$ & $\lim\limits_{x\to 2^+} \dfrac{x+1}{x-2} = \infty$

2a. what about $\lim\limits_{x\to 2} \dfrac{x^2-x-1}{(x-2)^2}$? $\to 1$, $\to 0$

$\lim\limits_{x\to 2^-} \dfrac{x^2-x-1}{(x-2)^2} = \infty$

$\lim\limits_{x\to 2} \dfrac{x^2-x-1}{(x-2)^2} = -\infty$

So $\lim\limits_{x\to 2} \dfrac{x^2-x-1}{(x-2)^2} = \boxed{\infty}$

3) $\lim\limits_{x\to 0} \dfrac{\sin x}{2x}$

$= \lim\limits_{x\to 0} \dfrac{1}{2} \cdot \dfrac{\sin x}{x} = \dfrac{1}{2}\cdot 1 = \boxed{\dfrac{1}{2}}$

4) $\lim\limits_{x\to 0} x^2 \sin\left(\frac{1}{x^2}\right) = 0$. Show why This is true.

Since $-1 \le \sin x \le 1$, Then $-1 \le \sin \frac{1}{x^2} \le 1$ also.

mult. Through by x^2, which is pos. as $x \to 0$ and we get

$-x^2 \le x^2 \sin \frac{1}{x^2} \le x^2$

Then since $\lim\limits_{x\to 0}(-x^2) = 0 = \lim\limits_{x\to 0} x^2$, by sandwich Thm,

$\lim\limits_{x\to 0} x^2 \sin \frac{1}{x^2} = 0$

5. Find The vertical and horizontal asymptotes for The following. State any discontinuities and The type of discontinuity.

$f(x) = \dfrac{(x-2)(x+3)}{(2x+3)(x+3)}$

$\boxed{VA: x = -\frac{3}{2}}$ only since at $\boxed{x=-3}$ There is a hole, not VA.

$\boxed{\text{infinite discontinuity}}$

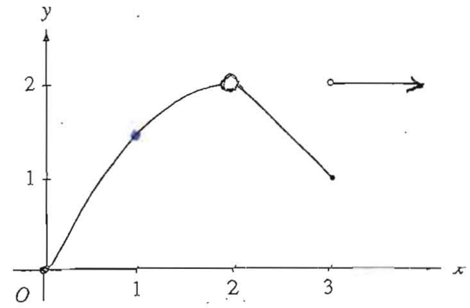
$\boxed{\text{Point disc}}$

$\lim\limits_{x\to\infty} f(x) = \frac{1}{2}$ & $\lim\limits_{x\to -\infty} f(x) = \frac{1}{2}$ So $\boxed{HA: y = \frac{1}{2}}$

Find limit: $f(x) = \dfrac{5}{x-4}$ when $x \to 4^-$

$\lim\limits_{x\to 4^-} \dfrac{5}{x-4} = -\infty$

Given The graph at The right, discuss its continuity and The functions limit at $x = 0, 1, 2, 3$ or as x approaches $0, 1, 2, 3$.



Continuous on $[0, 2) \cup (2, 3] \cup (3, \infty)$.

point discontinuity at $x = 2$.

jump discontinuity at $x = 3$.

cont. at $x = 0$ only from The right.

$\lim\limits_{x \to 0^+} f(x) = 0$, but $\lim\limits_{x \to 0} f(x) = \text{DNE}$

$\lim\limits_{x \to 1} f(x) = 1.5$

$\lim\limits_{x \to 2^-} f(x) = 2 = \lim\limits_{x \to 2^+} f(x)$, So $\lim\limits_{x \to 2} f(x) = 2$.

$$\left.\begin{array}{l} \lim\limits_{x \to 3^-} f(x) = 1 \\ \lim\limits_{x \to 3^+} f(x) = 2 \end{array}\right\} \text{ So } \lim\limits_{x \to 3} f(x) = \text{DNE}$$