Name____________________________________ **Ch 1 Review**

I. Evaluate the following limits algebraically.

1. $\lim_{x\to0}\frac{\sin(5x)}{x}\cdot\frac{5}{5}$

$\lim_{x\to0} 5\cdot\frac{\sin(5x)}{5x}$

$=5\cdot1=\boxed{5}$

2. $\lim_{x\to0}\frac{\frac{1}{x+3}\cdot\frac{3}{3}-\frac{1}{3}\cdot\frac{(x+3)}{(x+3)}}{x}$

$=\lim_{x\to0}\frac{\frac{3-(x+3)}{3(x+3)}}{x}$

$=\lim_{x\to0}\frac{\cancel{3}\overbrace{-x}^{-1}-\cancel{3}}{3(x+3)}\cdot\frac{1}{\cancel{x}}$

$=\lim_{x\to0}\frac{-1}{3(x+3)}=\boxed{-\frac{1}{9}}$

3. $\lim_{x\to-2}\left(3x^2-2x+1\right)$

$=3(-2)^2-2(-2)+1$

$=12+4+1$

$=\boxed{17}$

4. $\lim_{x\to\infty}\frac{4x^2+6x-3}{2x^2+1}$

$=\lim_{x\to\infty}\frac{4+\frac{6}{x}\to0-\frac{3}{x^2}\to0}{2+\frac{1}{x^2}\to0}$

$=\lim_{x\to\infty}\frac{4}{2}=\boxed{2}$

Note: HA $y=2$!

5. $\lim_{x\to\infty}\left(3+\frac{\sin x}{x}\right)$ $\to 0$

$=3+0$

$=\boxed{3}$

Note: HA $y=3$

6. $\lim_{x\to-9}\frac{x^2+6x-27}{x+9}$

$=\lim_{x\to-9}\frac{\cancel{(x+9)}(x-3)}{\cancel{x+9}}$

$=\lim_{x\to-9}(x-3)$

$=\boxed{-12}$

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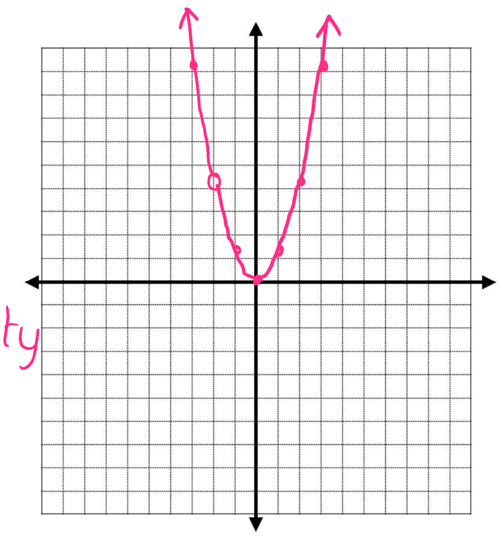
II. **Given the function** $f(x)=\dfrac{x^3+2x^2}{x+2} = \dfrac{x^2\cancel{(x+2)}}{\cancel{x+2}}$

$= x^2,\ x \neq -2$

1. Graph $f(x)$.



Find all points of discontinuity, identify the type of discontinuity and the condition for continuity that is not met.

$x=-2$, Removable hole discontinuity

$f(-2)$ und

$\lim\limits_{x\to -2} f(x) = 4$

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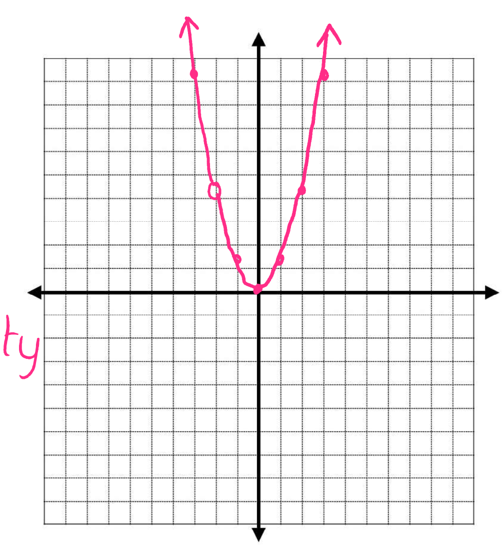
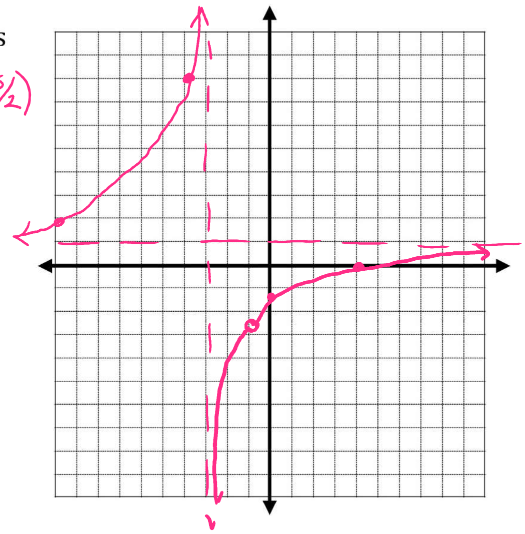


2. Graph $h(x)=\dfrac{x^2-3x-4}{x^2+4x+3}$ and identify all asymptotes



hole $\left(-1, -\frac{5}{2}\right)$

$$h(x)=\frac{(x-4)\cancel{(x+1)}}{(x+3)\cancel{(x+1)}}=\frac{x-4}{x+3},\ x=-1$$

$$\lim_{x\to\pm\infty}\frac{x-4}{x+3}=\lim_{x\to\pm\infty}\frac{1-\cancel{\frac{4}{x}}^{\to 0}}{1+\cancel{\frac{3}{x}}^{\to 0}}=1$$

$\boxed{\text{HA: } y=1}$

$\boxed{\text{VA: } x=-3}$, Nonremovable infinite disc

$$\lim_{x\to -3^-}\left(\frac{x-4}{x+3}\right)=\infty,\ \lim_{x\to -3^+}\left(\frac{x-4}{x+3}\right)=-\infty$$

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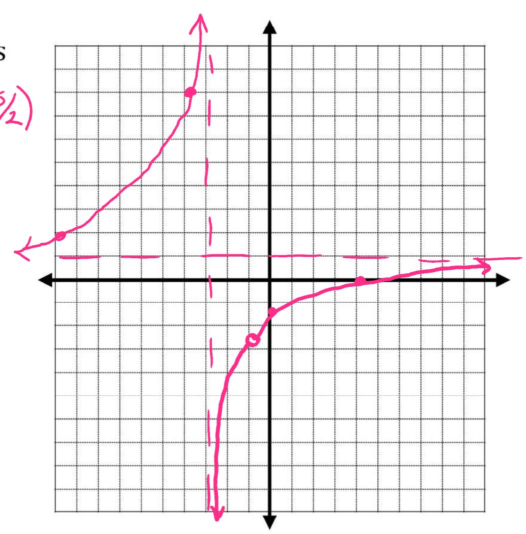

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III. Determine the value of c so that *f(x)* is continuous on the real number line.

1. $f(x)=\begin{cases} x+3 & x\le -1 \\ 2x-c & x>-1 \end{cases}$

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

$-1+3 = -2-C$

$2 = -2-C$

$4 = -C \Rightarrow \boxed{C=-4}$

Check: $f(-1)=2$

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

$2 = -2-(-4)$

$2 = 2 \checkmark$

$f(-1) = \lim_{x\to -1} f(x)$

2. $f(x)=\begin{cases} x+2c, & x\le 1 \\ cx^2+x+1 & x>1 \end{cases}$

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

$1+2c = c^2+2$

$0 = c^2-2c+1$

$0 = (c-1)^2$

$\boxed{C=1}$

Check: $f(1) = 1+2 = 3$

$\left.\begin{array}{l} \lim_{x\to 1^-} f(x) = 3 \\ \lim_{x\to 1^+} f(x) = 1^2+1+1 = 3 \end{array}\right\} \lim_{x\to 1} f(x) = 3$

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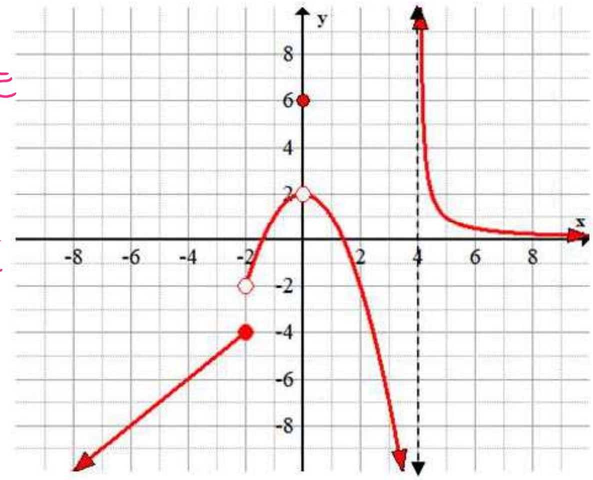
IV. From the graph, find the following:



1. $\lim\limits_{x\to -2^-} g(x) = -4$ $\quad \lim\limits_{x\to -2^+} g(x) = -2$ $\quad \lim\limits_{x\to -2} g(x) =$ DNE

2. $\lim\limits_{x\to 0^-} g(x) = 2$ $\quad \lim\limits_{x\to 0^+} g(x) = 2$ $\quad \lim\limits_{x\to 0} g(x) = 2$

3. $\lim\limits_{x\to 4^-} g(x) = -\infty$ $\quad \lim\limits_{x\to 4^+} g(x) = \infty$ $\quad \lim\limits_{x\to 4} g(x) =$ DNE

4. $g(-2) = -4$ $\quad g(0) = 6$ $\quad g(4) =$ und

V. Use any method to find the indicated limits

$$h(x)=\begin{cases} -x^2, & x\le -1 \\ 1-x, & x>-1 \end{cases}$$

5. $\lim\limits_{x\to -1^-} h(x) = -1$ $\quad \lim\limits_{x\to -1^+} h(x) = 2$ $\quad \lim\limits_{x\to -1} h(x) =$ DNE

$-(-1)^2$ $\quad 1-(-1)$

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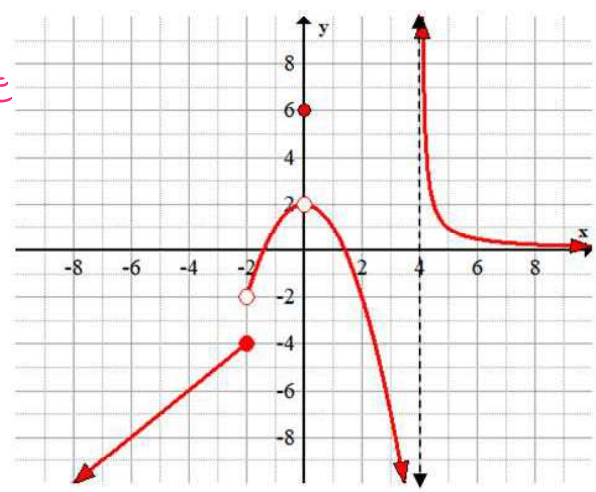

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