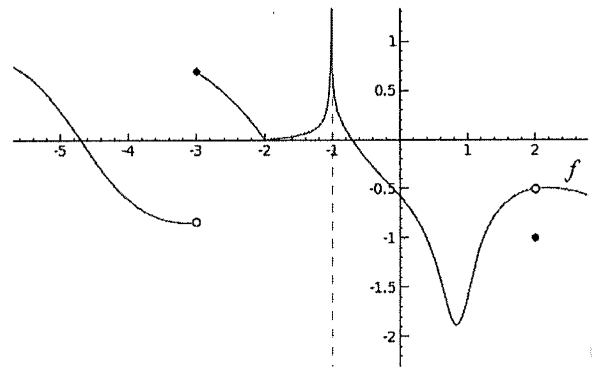
Calculus Name: KEY Period:

1. Use the graph below to answer the following questions.



a) $\lim_{x\to -3^+} f(x)$ $\approx .75$ b) $\lim_{x\to -3^-} f(x)$ $\approx -.75$ c) $\lim_{x\to -3} f(x)$ DNE

d) $\lim_{x\to -1} f(x)$ DNE, ∞ e) $\lim_{x\to 2} f(x)$ $\approx -.5$ f) $\lim_{x\to -2} f(x)$ 0

2. Determine each of the limits algebraically.

a) $\lim_{x\to -\infty} \dfrac{5x^2-3x-9}{2(4-x)^2}$

$\lim_{x\to -\infty} \dfrac{5x^2 \dots}{2x^2 \dots} = \boxed{\dfrac{5}{2}}$

b) $\lim_{x\to 5} \dfrac{x^2+3x-40}{2x-10}$ $\dfrac{(x-5)(x+8)}{2(x-5)}$

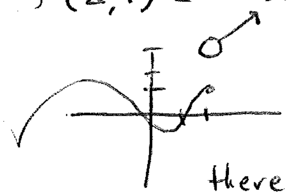
$\lim_{x\to 5} \dfrac{(x+8)}{2} = \boxed{\dfrac{13}{2}}$

c) $\lim_{x\to -3} \dfrac{2-\sqrt{7+x}}{x+3} \cdot \dfrac{(2+\sqrt{7+x})}{(2+\sqrt{7+x})} =$

$\lim_{x\to -3} \dfrac{4-(7+x)}{(x+3)(2+\sqrt{7+x})} = \dfrac{-3-x}{(x+3)(\quad)} = \dfrac{-1(x+3)}{(x+3)(\quad)}$

$\lim_{x\to -3} \dfrac{-1}{2+\sqrt{7+x}} = \boxed{\dfrac{-1}{4}}$

d) $\lim_{x\to 2} \begin{cases} x+1 & x<2 \\ \cos(\pi x) & x\ge 2 \end{cases}$ $(2,3) \leftarrow$ stops $(2,1) \leftarrow$ starts



$\boxed{\text{DNE}}$

there is a non-removable discontinuity

e) $\lim_{x\to -5} \dfrac{\dfrac{3}{x}+\dfrac{x+8}{5}}{x+5} \cdot \dfrac{(5x)}{5x} = \dfrac{15+(x+8)x}{5x(x+5)}$

$\lim_{x\to -5} \dfrac{x^2+8x+15}{5x(x+5)} = \dfrac{\cancel{(x+5)}(x+3)}{5x\cancel{(x+5)}} = \dfrac{-2}{-25} = \boxed{\dfrac{2}{25}}$

f) $\lim_{x\to 0} \dfrac{\sin(4x)}{3x^2} = \dfrac{\sin(4x)}{x} \cdot \dfrac{1}{3x}$

$= \lim_{x\to 0} \dfrac{\sin 4x}{4x} \cdot \dfrac{4}{3x} = 1 \cdot 0 = \boxed{0}$

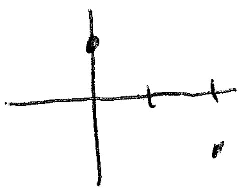
3. Find the values of c so that the function $h(x) = \begin{cases} x^2-c^2 & x<2 \\ x+c & x\ge 2 \end{cases}$ is continuous.

$\leftarrow (2, 4-c^2)$
$\leftarrow (2, 2+c)$
must be the same to be continuous

$4-c^2 = 2+c$
$0 = c^2+c-2$
$0 = (c+2)(c-1)$
$\boxed{c=-2}$ $\boxed{c=1}$

Calculus Name: Period:

4. Provide a function with the following criteria: f(0) > 0, f(2) < 0, but there are no zeros in the interval [0,2].



IVT says f(x) should have a zero, if F(x) is continous. So, f(x) must not be continuous

∞-answers for this, $\boxed{\frac{-1}{x-1}\text{ works}}$

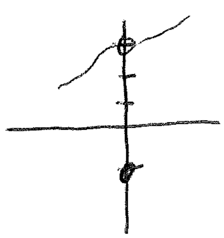
5. Create an equation with the given characteristics. There are two separate problems here, so there should be two different functions.

a) removable discontinuity at x = 3 and non-removable at x = -7.
hole asymptote

∞-answers, but

$$\boxed{f(x) = \frac{(x-3)}{(x-3)(x+7)}}$$

b) $\lim_{x\to 0} f(x) = 3$ and f(0) = -1



∞-answers, but

$$f(x) = \begin{cases} x+3 & x \neq 0 \\ -1 & x = 0 \end{cases}$$ works

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