Warm Up

Evaluate the following limits, if they exist:

1. $\lim\limits_{x\to 2}\dfrac{x-2}{x^3-8}$

$$\lim_{x\to 2}\frac{\cancel{(x-2)}}{\cancel{(x-2)}(x^2+2x+4)}$$

$$\lim_{x\to 2}\frac{1}{4+4+4}=\boxed{\frac{1}{12}}$$

2. $\lim\limits_{x\to 7}\dfrac{\left(\sqrt{x+2}-3\right)}{x-7}\cdot\dfrac{\left(\sqrt{x+2}+3\right)}{\left(\sqrt{x+2}+3\right)}$

$$\lim_{x\to 7}\frac{x+2-9}{(x-7)\left(\sqrt{x+2}+3\right)}$$

$$\lim_{x\to 7}\frac{\cancel{(x-7)}}{\cancel{(x-7)}\left(\sqrt{x+2}+3\right)}$$

$$\lim_{x\to 7}\frac{1}{3+3}=\boxed{\frac{1}{6}}$$

3. $\lim\limits_{h\to 0}\dfrac{(a+h)^2-a^2}{h}$

$$\lim_{h\to 0}\frac{(a+h-a)(a+h+a)}{h}$$

$$\lim_{h\to 0}\frac{\cancel{h}(2a+h)}{\cancel{h}}=\boxed{2a}$$

Questions from Homework

⑥b) $\lim_{x\to -8} \frac{x^2+16x+64}{x+8}$

$\lim_{x\to -8} \frac{\cancel{(x+8)}(x+8)}{\cancel{(x+8)}} = \frac{0}{1} = \boxed{0}$

⑤a) $\lim_{h\to 0} \frac{(4+h)^3-64}{h}$

$\lim_{h\to 0} \frac{((4+h)-4)((4+h)^2+4(4+h)+16)}{h}$

$\lim_{h\to 0} \frac{\cancel{h}((4+h)^2+4(4+h)+16)}{\cancel{h}} = 16+16+16$

$= \boxed{48}$

⑤f) $\lim_{h\to 0} \frac{\frac{1}{\cancel{(2+h)^2}}\,4\cancel{(2+h)^2} - \frac{1}{\cancel{4}}\,\cancel{4}(2+h)^2}{h(4(2+h)^2)}$

$\lim_{h\to 0} \frac{4-(2+h)^2}{4h(2+h)^2}$ ← difference of squares.

$\lim_{h\to 0} \frac{(2-(2+h))(2+(2+h))}{4h(2+h)^2}$

$\lim_{h\to 0} \frac{-\cancel{h}(4+h)}{4\cancel{h}(2+h)^2}$

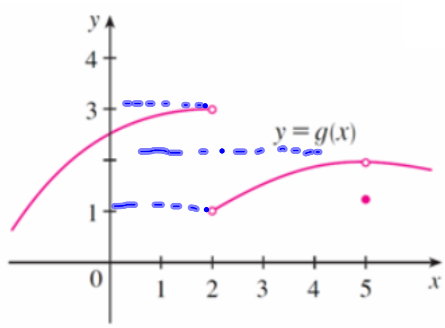
$\lim_{h\to 0} \frac{-1(4+0)}{4(2+0)^2} = \frac{-4}{16} = \boxed{\frac{-1}{4}}$

The common sense definition of a limit...

When does a limit exist?

One-sided limits

Use the graph shown below to evaluate the following limits:



1. $\lim_{x\to 2^-} g(x) = \boxed{3}$

"as x approaches 2 from the left"

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

"as x approaches 2 from the right"

3. $\lim_{x\to 2} g(x) = \boxed{\text{DNE}}$

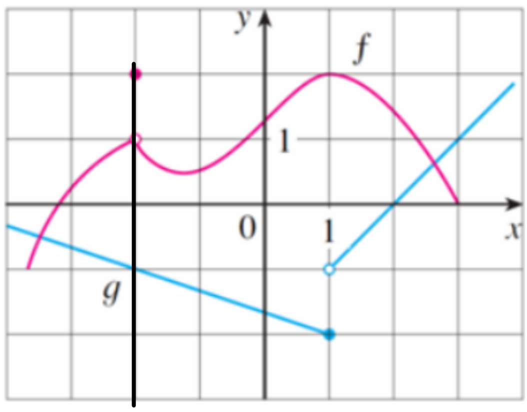
4. $\lim_{x\to 5^-} g(x) = \boxed{2}$

5. $\lim_{x\to 5^+} g(x) = \boxed{2}$

6. $\lim_{x\to 5} g(x) = \boxed{2}$

Notice... $g(5) = 1.2$ Pick the closed dot.

Example:



Evaluate each of the following:

$f(-2) = 2$

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

$g(1) = -2$

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

$\lim_{x\to 1} g(x) = \text{DNE}$

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

$\lim_{x\to -2} f(x) = 1$

Homework

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