Warm Up

Evaluate the following limits, if they exist:

1. $$\lim_{x\to 2}\frac{x-2}{x^3-8}$$

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

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

2. $$\lim_{x\to 7}\frac{\sqrt{x+2}-3}{x-7}\cdot\frac{(\sqrt{x+2}+3)}{(\sqrt{x+2}+3)}$$

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

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

$$\lim_{x\to 7}\frac{1}{\sqrt{7+2}+3}=\boxed{\frac{1}{6}}$$

3. $$\lim_{h\to 0}\frac{(a+h)^2-a^2}{h}$$

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

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

$$\lim_{h\to 0}2a+0=\boxed{2a}$$

Questions from Homework

4 g) $\lim_{x\to 9} \frac{(x-9)(\sqrt{x}+3)}{(\sqrt{x}-3)(\sqrt{x}+3)}$

$\lim_{x\to 9} \frac{\cancel{(x-9)}(\sqrt{x}+3)}{\cancel{(x-9)}} = \boxed{6}$

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

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

$\lim_{h\to 0} \frac{\cancel{h}[(4+h)^2+4(4+h)+16]}{\cancel{h}} = \boxed{48}$

5 c) $\lim_{h\to 0} \frac{\frac{1}{1+h}-\frac{1}{1}}{h}$ CD = (1+h)

$\lim_{h\to 0} \frac{\frac{1}{1+h}-\frac{1+h}{1+h}}{h}$

$\lim_{h\to 0} \frac{* \frac{1-(1+h)}{1+h}}{h}$ $* \frac{1-1-h}{1+h}$

$\lim_{h\to 0} \frac{-\cancel{h}}{1+h} \times \frac{1}{\cancel{h}} = \frac{-1}{1+h} = \boxed{-1}$

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

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

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

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

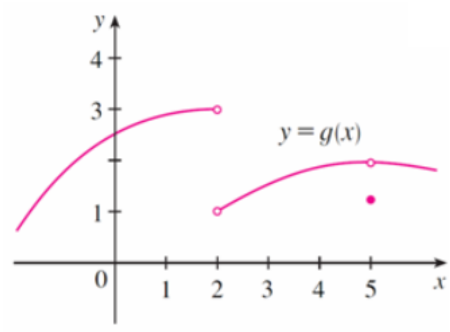
$\lim_{h\to 0} \frac{(-\cancel{h})(4+h)}{4\cancel{h}(2+h)^2} = \frac{-4}{16} = -\frac{1}{4}$

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. $\lim_{x\to 2^-} g(x) = \boxed{}$
"as x approaches 2 from the left"

2. $\lim_{x\to 2^+} g(x) = \boxed{}$
"as x approaches 2 from the right"

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

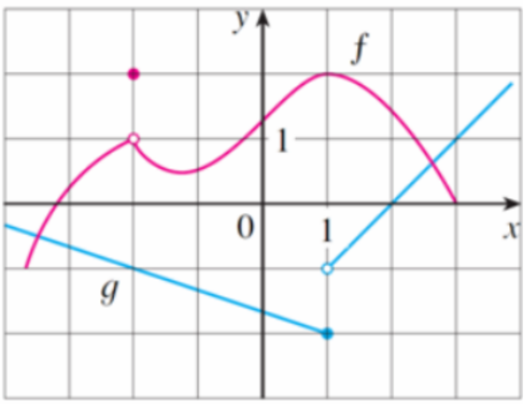
4. $\lim_{x\to 5^-} g(x) = \boxed{}$

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

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

Notice... $g(5) =$

Example:



Evaluate each of the following:

$f(-2) =$

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

$g(1) =$

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

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

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

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

Homework

Page 27

1, 2, 3