

Sunday, October 14, 2018  
5:24 PM

KEY

Precalc

1.4C

Obj: To calculate the difference quotient

Hwk: 1.4C #79, 80, 82 - 86 all; Check answers!

Do Now:

Evaluate:

If  $f(x) = x^2 - 4x + 7$ , find

a)  $f(2+h)$

b)  $f(2)$

c)  $\frac{f(2+h) - f(2)}{h}$

$$\begin{aligned}
 &(2+h)^2 - 4(2+h) + 7 \\
 &(2+h)(2+h) - 8 - 4h + 7 \\
 &4 + 4h + h^2 - 4h - 1 \\
 &h^2 + 3
 \end{aligned}$$

$$\begin{aligned}
 &(2)^2 - 4(2) + 7 \\
 &4 - 8 + 7 = \\
 &-4 + 7 = \\
 &3
 \end{aligned}$$

$$\frac{h^2 + 3 - 3}{h} = \frac{h^2}{h} = h$$

$h \neq 0$

Recap:

IMPLIED Domain not stated in problem:

- Polynomial: all real numbers  $(-\infty, \infty)$  or  $\mathbb{R}$
- Rational: (fraction): denom.  $\neq$  zero
- Radical: (EVEN roots): radicand is not NEGATIVE ( $\geq 0$ )
- Rational functions with radical denominators: radicand must be POSITIVE ( $> 0$ )

Find the domain of each. Use interval notation when possible.

Ex. 3)  $f(x) = \sqrt{x+4}$  ← pos.

$$\begin{aligned}
 x+4 &\geq 0 \\
 x &\geq -4
 \end{aligned}$$

$[-4, \infty)$

Ex. 4)  $g(x) = \frac{\sqrt{x-2}}{x^2-25}$  ← pos.

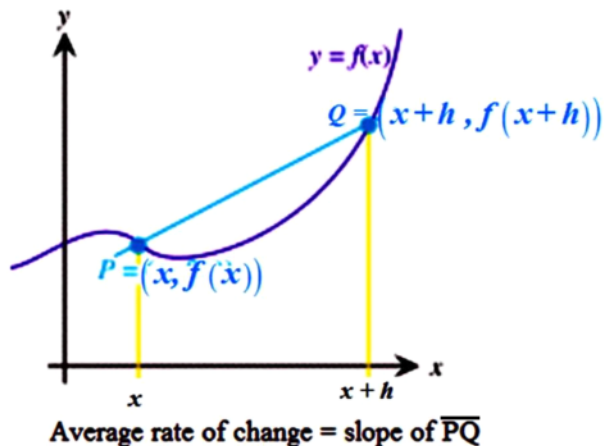
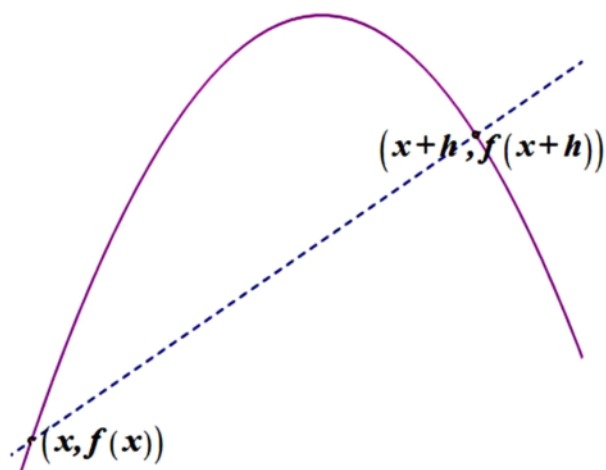
$$\begin{aligned}
 &x-2 \geq 0 \\
 &x \geq 2
 \end{aligned}
 \left\{
 \begin{aligned}
 &x^2 - 25 \neq 0 \\
 &x^2 - 25 = 0 \\
 &(x+5)(x-5) = 0 \\
 &x \neq -5 \quad x \neq 5
 \end{aligned}
 \right.$$

$[2, 5) \cup (5, \infty)$

In Do Now, you found the Difference Quotient:

**Difference Quotient:**  $\frac{f(x+h) - f(x)}{h}, h \neq 0$

\*Remember, this is used in calculus! It finds the slope of the secant line joining the points  $(x, f(x))$  and  $(x+h, f(x+h))$  on the graph of function  $f$ ; aka "average rate of change" between the 2 pts



Ex. 1) If  $f(x) = x^2 - 9$  find the difference quotient

$$\frac{f(x+h) - f(x)}{h}, h \neq 0$$

$$\begin{aligned} f(x+h) &= (x+h)^2 - 9 \\ &= (x+h)(x+h) - 9 \\ &= x^2 + 2xh + h^2 - 9 \end{aligned}$$

$$f(x) = x^2 - 9$$

$$\begin{aligned} \text{Diff. Quotient: } & \frac{x^2 + 2xh + h^2 - 9 - (x^2 - 9)}{h} = \frac{2xh + h^2}{h} \\ & = \frac{\cancel{h}(2x+h)}{\cancel{h}} = \boxed{2x+h} \end{aligned}$$

Ex. 2) If  $g(x) = 4x^2 - 2x$ , find  $\frac{g(2+h) - g(2)}{h}, h \neq 0$

$$\begin{aligned} g(2+h) &= 4(2+h)^2 - 2(2+h) \\ &= 4(2+h)(2+h) - 4 - 2h \\ &= 4(4 + 4h + h^2) - 4 - 2h \\ &= 16 + 16h + 4h^2 - 4 - 2h \\ &= 4h^2 + 14h + 12 \end{aligned}$$

$$\begin{aligned} g(2) &= 4(2)^2 - 2(2) \\ &= 4(4) - 4 \\ &= 16 - 4 \\ &= 12 \end{aligned}$$

$$\begin{aligned} \text{diff. quotient: } \frac{4h^2 + 14h + 12 - 12}{h} &= \frac{4h^2 + 14h}{h} = \frac{h(4h+14)}{h} \\ &= \boxed{4h + 14} \\ & \quad h \neq 0 \end{aligned}$$

Things to go over after Summer Assignment/Prerequisite Skills Assessment:

1. Solve:  $\frac{2}{(x-4)(x-2)} = \frac{1}{x-4} + \frac{2}{x-2}$

$$2 = x-2 + 2(x-4)$$

$$2 = x-2 + 2x-8$$

$$2 = 3x-10$$

$$12 = 3x$$

$$x = 4$$

$$x \neq 4, 2$$

NO SOLUTION

2. Solve:  $\frac{2}{3}(x-1) + \frac{1}{4}x = 10$  (12)

\* MULT BY LCD TO CLEAR FRACTION

$$8(x-1) + 3x = 120$$

$$8x - 8 + 3x = 120$$

$$11x - 8 = 120$$

$$11x = 128$$

$$x = \frac{128}{11}$$

\* Check by substitution on calc ✓

3. Solve:  $3x^2 - 14x = 5$

$$3x^2 - 14x - 5 = 0$$

$$(3x+1)(x-5) = 0$$

$$3x+1=0$$

$$3x = -1$$

$$x = -\frac{1}{3}$$

$$x-5=0$$

$$x = 5$$

4. Complete the square & solve:

a.  $x^2 + 12x + 25 = 0$

$$x^2 + 12x + \frac{36}{(6)^2} = -25 + \frac{36}{(6)^2}$$

$$\sqrt{(x+6)^2} = \sqrt{11}$$

$$x+6 = \pm \sqrt{11}$$

$$x = -6 \pm \sqrt{11}$$

b.  $4x^2 + 16x + 9 = 0$

$$4x^2 + 16x = -9$$

$$4(x^2 + 4x + \frac{4}{(2)^2}) = -9 + \frac{16}{(2)^2}$$

$$4\frac{(x+2)^2}{4} = \frac{7}{4}$$

$$\sqrt{(x+2)^2} = \sqrt{\frac{7}{4}}$$

$$x+2 = \pm \frac{\sqrt{7}}{2}$$

$$x = -2 \pm \frac{\sqrt{7}}{2}$$