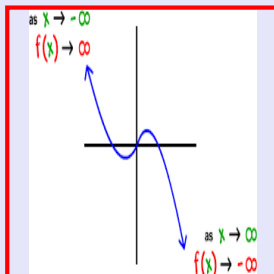


Math 245
Spring 2022
Lecture 16



Class QZ 6

use Quadratic Formula to Solve

$$x^2 - 2x - 15 = 0$$

Discriminant

$$a = 1$$

$$b = -2$$

$$c = -15$$

$$b^2 - 4ac = (-2)^2 - 4(1)(-15) = 4 + 60 = 64 \checkmark$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-2) \pm \sqrt{64}}{2(1)} = \frac{2 \pm 8}{2}$$

$$x = \frac{2+8}{2} = \frac{10}{2} = 5$$

$$x = \frac{2-8}{2} = \frac{-6}{2} = -3$$

$$\{-3, 5\}$$

Solution Set

Consider the function $S(x) = x^2 + 2x$

1) Find $S(-2) = (-2)^2 + 2(-2) = 4 - 4 = 0$ $(-2, 0)$

2) Solve $S(x) = 0$
 $x^2 + 2x = 0$
 $x(x+2) = 0$
 $x = 0$ or $x + 2 = 0$
 $x = -2$
 $(0, 0), (-2, 0)$

Find difference quotient $\frac{f(x+h) - f(x)}{h}$, then evaluate for $h=0$.

$$\frac{S(x+h) - S(x)}{h} = \frac{(x+h)^2 + 2(x+h) - (x^2 + 2x)}{h}$$

$$= \frac{(x+h)(x+h) + 2x + 2h - x^2 - 2x}{h}$$

$$= \frac{x^2 + xh + xh + h^2 + 2x + 2h - x^2 - 2x}{h}$$

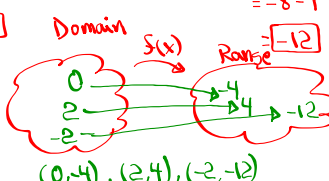
$$= \frac{2xh + h^2 + 2h}{h} = h(2x + h + 2) = 2x + h + 2$$

Consider $S(x) = x^3 - 4$

1) Find $S(0) = 0^3 - 4 = -4$

3) Find $f(-2) = (-2)^3 - 4 = -8 - 4 = -12$

2) Find $f(2) = 2^3 - 4 = 8 - 4 = 4$



$(0, -4), (2, 4), (-2, -12)$

4) Find the difference quotient $\frac{f(x+h) - f(x)}{h}$

then evaluate for $h=0$

$$\frac{S(x+h) - S(x)}{h} = \frac{(x+h)^3 - 4 - (x^3 - 4)}{h}$$

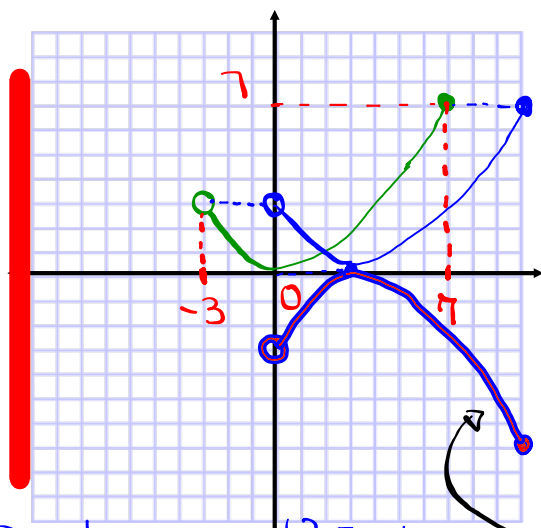
$$= \frac{(x+h)(x+h)(x+h) - x^3}{h} = \frac{(x+h)(x^2 + xh + xh + h^2) - x^3}{h}$$

$$= \frac{(x+h)(x^2 + 2xh + h^2) - x^3}{h} = \frac{x^3 + 2x^2h + xh^2 + x^2h + 2xh^2 + h^3 - x^3}{h}$$

$$= \frac{3x^2h + 3xh^2 + h^3}{h} = h(3x^2 + 3xh + h^2) = 3x^2 + 3xh + h^2$$

for $h=0$ $3x^2 + 3x(0) + 0^2 = 3x^2$

Consider the graph below:



1) Domain $(-3, 7]$

2) Range $[0, 7]$

3) All intercepts.

X-Int $(0, 0)$

Y-Int $(0, 0)$

4) Function or not? Explain.

Yes, It is a function by V.L.T.

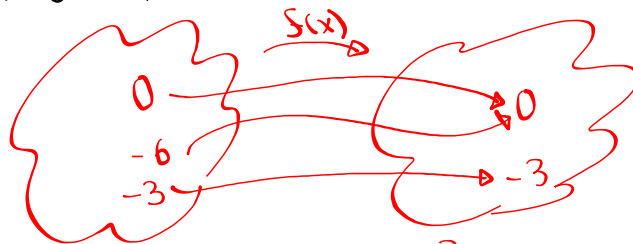
5) Move the graph 3 units right, then make reflection about x-axis.

$$f(x) = |x+3| - 3$$

find $f(0) = |0+3| - 3 = |3| - 3 = 3 - 3 = \boxed{0}$

find $f(-6) = |-6+3| - 3 = |-3| - 3 = 3 - 3 = \boxed{0}$

find $f(-3) = |-3+3| - 3 = |0| - 3 = 0 - 3 = \boxed{-3}$



Domain

Range

$(0, 0), (-6, 0), (-3, -3)$

Given $x^2 + (y+3)^2 = 9$

Find x when $y=0$. $\rightarrow x^2 + 9 = 9$

$x^2 + (0+3)^2 = 9$
 $x^2 + 3^2 = 9$

$x^2 = 0$
 $x = 0$

$(0, 0)$
 Same x \rightarrow Diff. y .
 $(0, -6)$

Find x when $y=-6$.

$x^2 + (-6+3)^2 = 9$
 $x^2 + (-3)^2 = 9$
 $x^2 + 9 = 9$

$x^2 = 0$
 $x = 0$

Not a Function.

$x^2 + (y+3)^2 = 9$

Circle

Center $(0, -3)$

Radius 3

