

# 5.5 Complex #'s & Roots

CA # 8.0

10/26/09

Objective

① ..

② ..

Vocabulary

$$\textcircled{1} g(x) = (x+2)^2 - 4$$

$$h = -2$$

$$k = -4$$

$$a = 1$$

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

X

-14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14

$$\textcircled{3} g(x) = \frac{1}{2}x^2 + 1$$

$$a = \frac{1}{2} \text{ constant}$$

$$h = 0$$

$$k = 1$$

10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
-1  
-2  
-3  
-4  
-5  
-6  
-7  
-8  
-9  
-10

Y



$$8. h(x) = x^2 - 6x + 0$$

$$y = 25 - 30$$

\* opens up

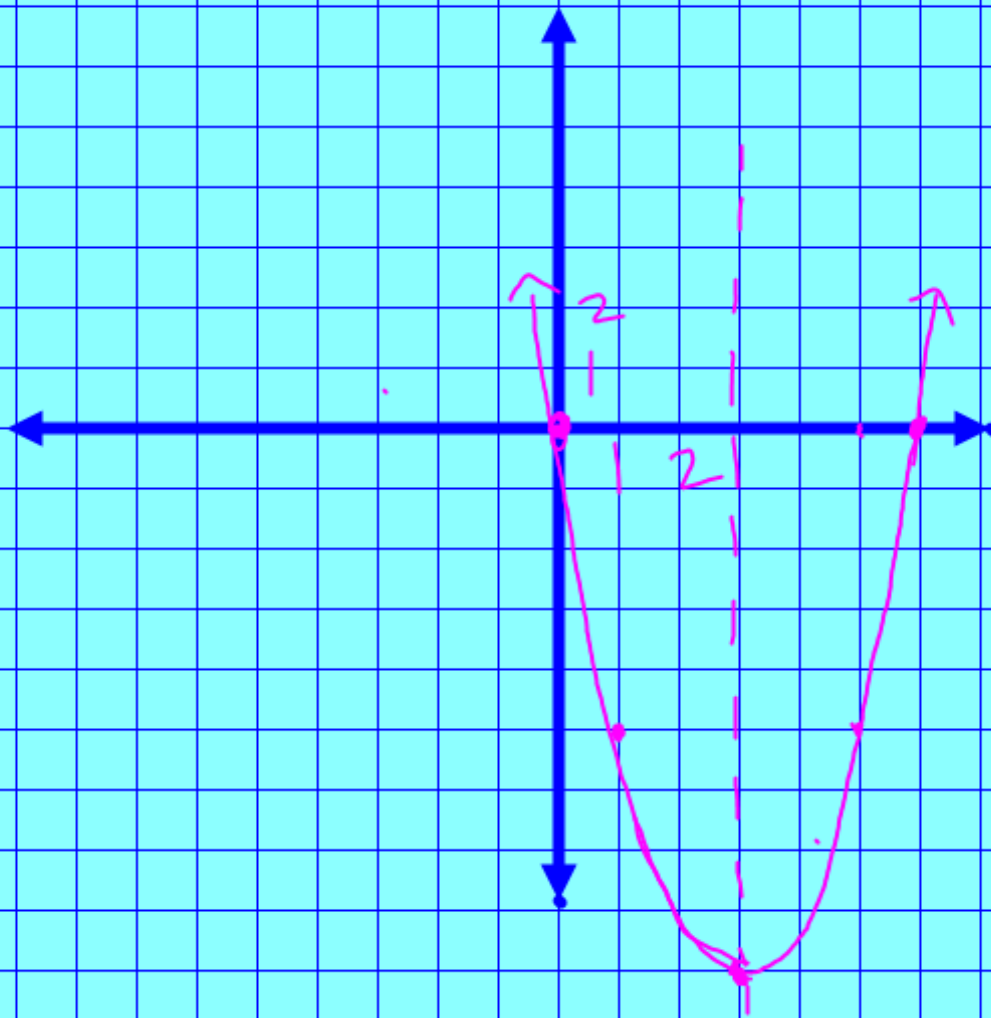
$$x = \frac{-b}{2a} = \frac{6}{2} = 3$$

$$y = -9$$

$$* x = 3$$

$$* (3, -9)$$

$$* y \text{ int} = 0$$



12, 18,

$$\textcircled{12} \quad 4x^2 + 8x = 0$$

$$4x(x+2) = 0$$

$$x = 0, -2$$

$$\frac{4x}{4} = \frac{0}{4}$$

$$x + 2 = 0$$

$$-2 \quad -2$$

- roots

- ~~x~~ int. (0, -2)- solutions 0, -2- zeros 0, -2

$$\textcircled{x=0}$$

$$\textcircled{x=-2}$$

$$h(x) = \underline{5x^2 - 20x + 9}$$

$$h(x) = a(\underline{x-h})^2 + k$$

$$h(x) = 5(x^2 - 4x + 4) + 9$$

-20

$$h(x) = 5(x-2)^2 - 11$$

Vertex  $(2, -11)$

$$\sqrt{-1} = i$$

$$i^2 = -1$$

What is a mathematicians favorite  
dessert?

$\sqrt{-1}$  ice cream

Ex. 1 A

$$3\sqrt{-16} = 3\sqrt{16 \cdot -1}$$

*4*     *i*

$$= 12i$$

1 B

$$-\sqrt{-75} = -\sqrt{-1 \cdot 25 \cdot 3}$$

*i*     *5*

$$= -5i\sqrt{3}$$

$$V|a \quad \sqrt{-12} = \sqrt{\overset{i}{-1} \cdot \overset{3}{4} \cdot 3} = 2i\sqrt{3}$$

$$V|b \quad 2\sqrt{-36} = 2\sqrt{\overset{i}{-1} \cdot \overset{6}{36}} = 12i$$

$$V|c \quad -\frac{1}{3}\sqrt{-63} = -\frac{1}{3}\sqrt{\overset{i}{-1} \cdot \overset{3}{9} \cdot 7} = -i\sqrt{7}$$



$$\text{Ex. 2A} \quad \sqrt{x^2} = \sqrt{-81}$$

$$x = \pm \sqrt{-1 \cdot 81}$$

$$x = \pm 9i$$

$$\text{2B} \quad 3x^2 + 75 = 0$$

$$\frac{3x^2}{3} = \frac{-75}{3}$$

$$\sqrt{x^2} = \sqrt{-25}$$

$$x = \pm 5i$$

### Graphing Calculator

Equations
Settings
Intersection
Plot Points

y<sub>1</sub> =

y<sub>2</sub> =

y<sub>3</sub> =

y<sub>4</sub> =

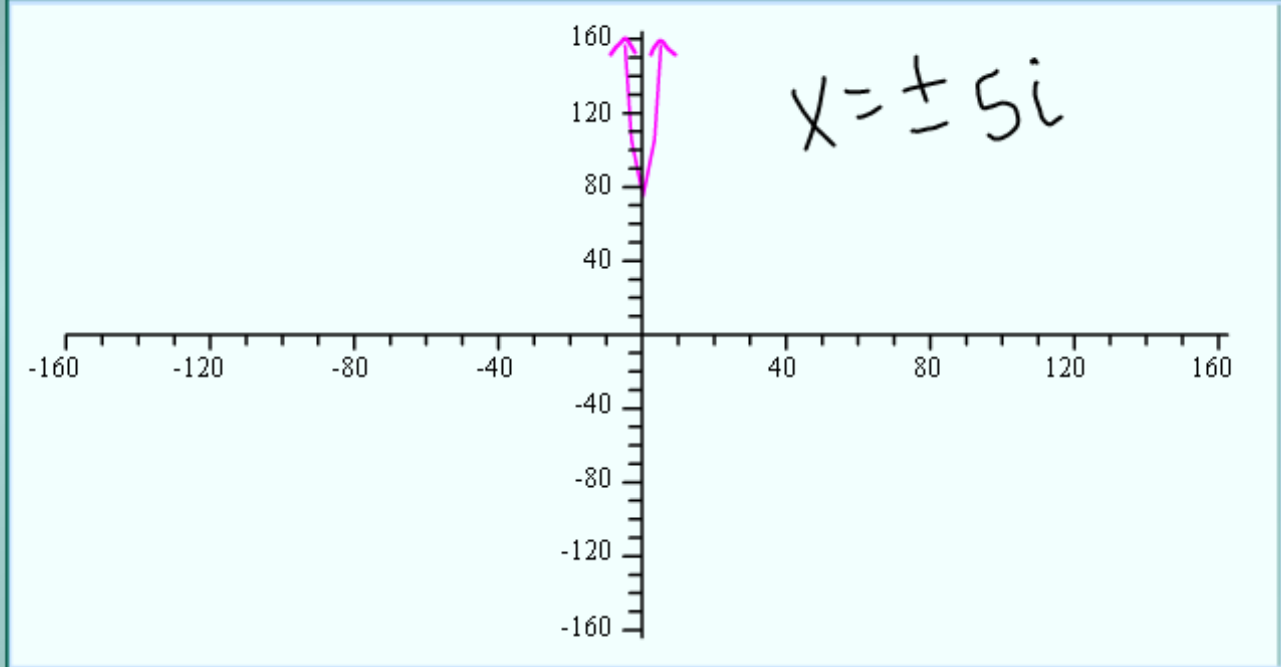
|   |                |                |     |     |
|---|----------------|----------------|-----|-----|
| / | x              | π              | sin | e   |
| * | x <sup>2</sup> | x <sup>3</sup> | cos | ln  |
| - | ^              | √              | tan | log |
| + | (              | )              | abs |     |

Deg  
 Rad

GRAPH
ZOOM IN
ZOOM OUT

TRACE
◀
▶

| x  | y   |
|----|-----|
| -5 | 150 |
| -4 | 123 |
| -3 | 102 |
| -2 | 87  |
| -1 | 78  |
| 0  | 75  |
| 1  | 78  |
| 2  | 87  |
| 3  | 102 |
| 4  | 123 |



$$\sqrt{2a} \quad \sqrt{x^2} = \sqrt{-36} \quad x = \pm 6i$$

$$\sqrt{2b} \quad x^2 + 48 = 0$$

$$\sqrt{x^2} = \sqrt{-48}$$

$$x = \sqrt{-1 \cdot 16 \cdot 3} = \pm 4i\sqrt{3}$$

$$\sqrt{2c} \quad 9x^2 + 25 = 0 \quad \sqrt{x^2} = \sqrt{\frac{-25}{9}}$$

$$\frac{9x^2}{9} = \frac{-25}{9} \quad x = \pm \frac{\sqrt{-25}}{\sqrt{9}} \quad x = \pm \frac{5i}{3}$$

Ex.3

$$3x - 5i = 6 - (10y)i$$

Real

$$\frac{3x}{3} = \frac{6}{3}$$

$$x = 2$$

Imaginary

$$\frac{-5}{-10} = \frac{-10y}{-10}$$

$$\frac{1}{2} = y$$

$$\sqrt{3a} \quad x = -4 \quad y = -\frac{3}{10}$$

$$\sqrt{3b} \quad -8 + (6y)i = 5x - i\sqrt{6}$$

$$\frac{-8}{5} = \frac{5x}{5}$$

$$x = -\frac{8}{5}$$

$$\frac{6y}{6} = \frac{-\sqrt{6}}{6}$$

$$y = -\frac{\sqrt{6}}{6}$$

Ex.4 A

$$f(x) = x^2 - 2x + 5$$

$$0 = (x^2 - 2x + 1) + 4$$

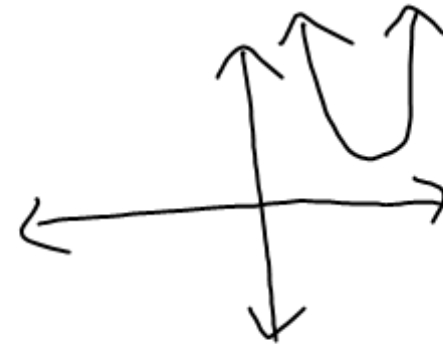
$$0 = (x-1)^2 + 4$$

$$-4 = (x-1)^2$$

$$\sqrt{(x-1)^2} = \sqrt{-4}$$

$$x-1 = \pm 2i$$

$$x = 1 \pm 2i$$

Vertex  
(1, 4)

$$4B. \quad g(x) = x^2 + 10x + 35$$

$$0 = x^2 + 10x + 35$$

$$0 = (x^2 + 10x + 25) + 35$$

$$0 = (x+5)^2 + 10$$

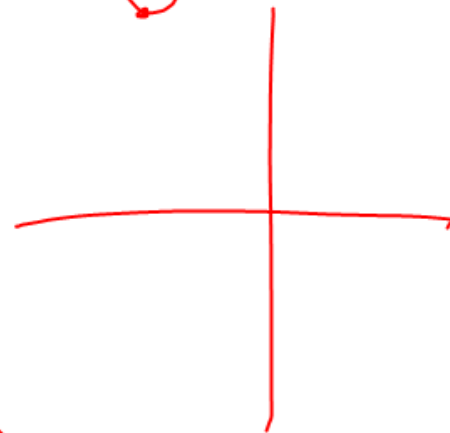
$$\sqrt{-10} = \sqrt{(x+5)^2}$$

$$\pm \sqrt{-10} = x + 5$$

$$-5 \quad -5$$

$$x = -5 \pm i\sqrt{10}$$

Vertex  
(-5, 10)



Ex. 5

a + bi

(A)

$2i - 15$

$a + bi$

$-15 + 2i$

$a - bi$

$-15 - 2i$

Complex  
Conjugate

$a - bi$

(B)

$-4i$

$a + bi$

$0 - 4i$

$a - bi$

$0 + 4i$

 $4i$