



# 2/14/11 Vickers Scale

$$Hd^2 = 1.89$$

\* Where d is depth of indentation

$$H = 131 \quad d^2 = \frac{1.89}{131} \quad d = \pm \sqrt{\frac{1.89}{131}} \quad \text{* remember that there are 2 possible numbers}$$

example 1:

Copper  $\approx 140$

platinum  $\approx 125$

galena  $\approx 80$

gold = 50

graphite = 12

hematite = 755

$$\begin{aligned} \text{Cu} &= d = \pm \sqrt{\frac{1.89}{140}} = \pm 0.12296 \text{ mm} \\ \text{Pt} &= d = \pm \sqrt{\frac{1.89}{125}} = \pm 0.12296 \text{ mm} \\ \text{hematite} &= d = \pm \sqrt{\frac{1.89}{755}} = \pm 0.05003 \text{ mm} \\ \text{Galena} &= d = \pm \sqrt{\frac{1.89}{80}} = \pm 0.15357 \text{ mm} \\ \text{Au} &= d = \pm \sqrt{\frac{1.89}{50}} = \pm 0.19442 \text{ mm} \\ \text{Graphite} &= d = \pm \sqrt{\frac{1.89}{12}} = \pm 0.39686 \text{ mm} \end{aligned}$$

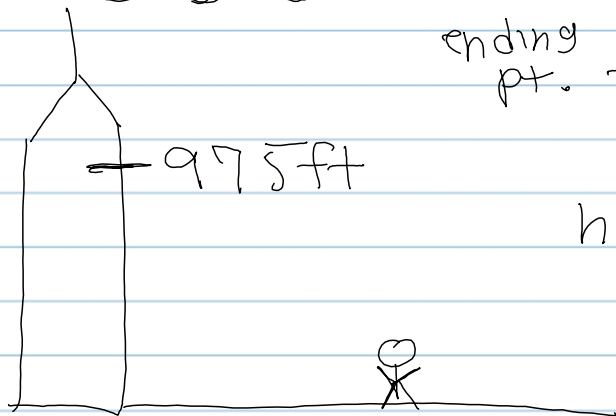
\* make sure to divide first and then find the square root or use parenthesis

$$3 \times \frac{1}{3} (x+5)^2 = 7 \times 3 \quad x = -5 + \sqrt{21}$$

$$\sqrt{(x+5)^2} = \sqrt{21} \quad -5 - \sqrt{21}$$

$$\begin{aligned} x+5 &= \sqrt{21} \\ -5 & \quad -5 \end{aligned}$$

# Falling Object



Velocity of gravity  
↓

ending pt.  $\rightarrow h = -16t^2 + h_0$  ← initial height

$$h = -16t^2 + 975$$

$$0 = -16t^2 + 975$$

$$-975 \qquad -975$$

$$\frac{-975}{-16} = \frac{-16t^2}{-16}$$

$$\sqrt{t^2} = \sqrt{\frac{-975}{16}}$$

$$t = \sqrt{\frac{-975}{-16}}$$

$$t = 7.8 \text{ sec}$$

1100 ft/s

$$1100 \text{ ft} = 1 \text{ sec}$$

$$975 \text{ ft} = x \text{ sec}$$

$$\frac{1100 \text{ ft}}{1100} = \frac{975}{1100} = 0.9 \text{ sec}$$

$\Delta t = 6.9$  seconds

~~$$\sqrt{t^2} - 4t = 3t^2 = 1$$

$$-3t^2 \qquad -3t^2$$

$$\sqrt{t^2} - 4t = -1$$

$$4t^2 - 4t + 1 = 0$$~~

Graph:

$$y = 2(x+2)^2 + 1$$

vertex = (2, 1)

$$y = x^2 - 2x - 3$$

$$\frac{-b}{2a} = \frac{-(-2)}{2} = \frac{2}{2} = 1$$

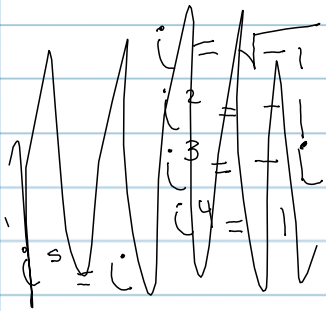
$$y = 1^2 - 2(1) - 3$$

$$1 - 2 - 3$$

$$y = -4$$

$$\text{vertex} = (1, -4)$$

\*substitute 0 for y to find roots



$$3x^2 + 10 = -26$$

$$3x^2 = -36$$

$$x^2 = -12$$

$$x = \sqrt{-12}$$

$$x = \sqrt{-1} \cdot \sqrt{12}$$

$$i\sqrt{12}$$

$$i\sqrt{4} \cdot \sqrt{3}$$

$$i2\sqrt{3}$$

$$2i\sqrt{3}$$

$$\begin{aligned} \textcircled{1} \quad x^2 &= -16 \\ x &= \sqrt{-16} \\ x &= \sqrt{-1} \cdot \sqrt{16} \\ x &= i\sqrt{16} \\ x &= \cancel{16} (4i) \end{aligned}$$

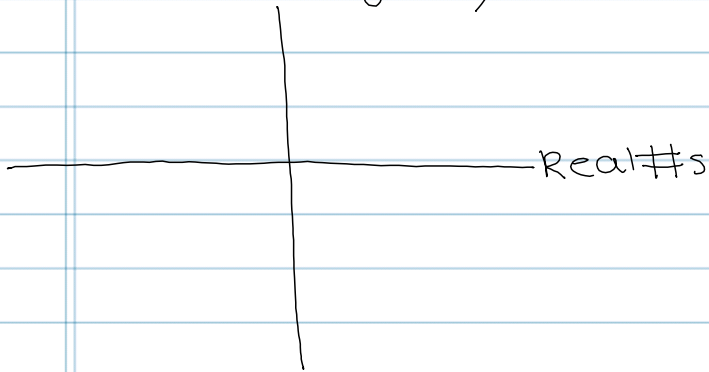
$$\begin{aligned} \textcircled{2} \quad x^2 + 5 &= 4 \\ x^2 &= -1 \\ x &= \sqrt{-1} \\ x &= i \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad x^2 - 7 &= 4x^2 + 5 \\ x^2 &= 4x^2 + 12 \\ -3x^2 &= 12 \\ x^2 &= -4 \\ x &= \sqrt{-4} \\ x &= \sqrt{-1} \cdot \sqrt{4} \\ x &= i\sqrt{4} \\ x &= 2i \end{aligned}$$

∩

# Graphing Imaginary #s

$i$  (imag. #s)



Standard Form:

$$a + bi$$

↑

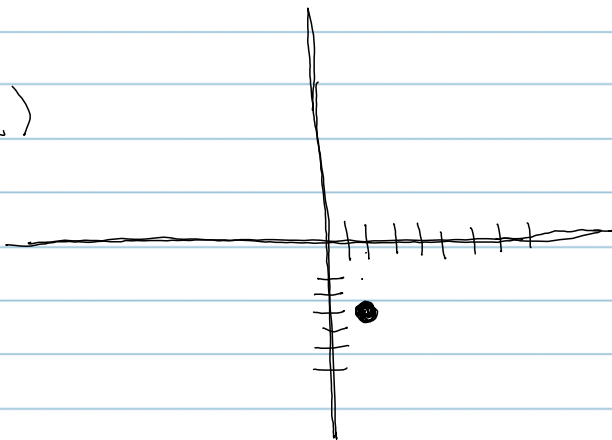
Real

↑

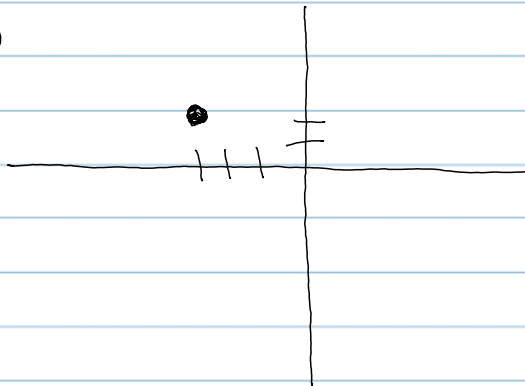
$i$  (imag)

example

$$(2 - 3i)$$



$$(-3 + 2i)$$



# Addition & subtraction 😊

H.  
2/22/11

$$\textcircled{1} (5+3i) + (2+4i)$$
$$7+7i$$

$$\textcircled{2} (3-2i) + (1+i)$$
$$4-i$$

$$\textcircled{3} (5+i) - (3-8i)$$

$$\textcircled{4} i - (6+i) + (4-2i)$$
$$-2-2i$$

## Multiplication:

$$\textcircled{1} (7-3i)(1-4i)$$
$$7-28i-3i+12i^2$$
$$7-31i \quad \downarrow$$
$$(12)(-1)$$
$$\downarrow$$
$$\textcircled{-5-31i}$$

$$\textcircled{1} -2i(5+i) \rightarrow -10i-2i^2$$
$$-10i+2$$
$$\textcircled{2-10i}$$

$$\textcircled{2} (1+3i)(1-i)$$
$$1-i+3i-3i^2$$
$$1+2i-3(-1)$$
$$4+2i$$

~~Complex Conjugate  $\Rightarrow$  Division~~

~~$(2+i)(2+i) = (5+i)(2-i) = 4+2i-2i-i^2 = 4-(-1) = 5$~~