(69) $(2+3i)^3$; form $a+bi$

$(2+3i)(2+3i)(2+3i)$

$(2+3i)(4+6i+6i+9i^2)$

$9(-1)$

-9

$(2+3i)(-5+12i)$

$-10+24i-15i+36i^2$

$36(-1)$

-36

$-46+9i$

$i = \sqrt{-1}$

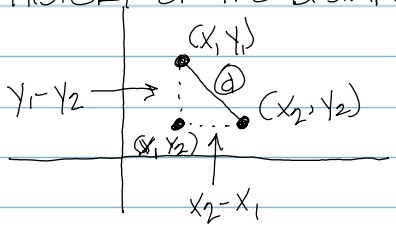
$i^2 = -1$

SECTION 2.1

MIDPOINT & DISTANCE FORMULA

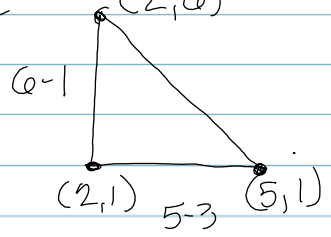
Distance Formula: $d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

THE HISTORY OF THE DISTANCE FORMULA:



Pythagorean Theorem

$a^2+b^2=c^2$



$d^2 = (x_2-x_1)^2+(y_2-y_1)^2$

$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$(2, 6)$

$(5, 1)$

$d = \sqrt{(2-5)^2+(6-1)^2}$

$d = \sqrt{(-3)^2+(5)^2}$

$d = \sqrt{9+25}$

$d = \sqrt{34}$

EX: $\sqrt{120} = \sqrt{4 \cdot 30}$

$= 2\sqrt{30}$

* look for numbers times itself

$2 \mid 120$

$2 \mid 60$

$2 \not| 30$

$3 \mid 15$

5

$\sqrt{2 \cdot 2 \cdot 3 \cdot 5}$

$2\sqrt{2 \cdot 3 \cdot 5}$

$2\sqrt{30}$ ✓

Ex: $\sqrt[3]{120} = \sqrt[3]{2\cdot2\cdot2\cdot3\cdot5}$

$2\sqrt[3]{3\cdot5}$

$2\sqrt[3]{15}$

Ex:

$\sqrt{500} \rightarrow 2|500 \quad 2|250 \quad 5|125 \quad 5|25 \quad 5 \quad = \sqrt{2\cdot2\cdot5\cdot5\cdot5}$ "prime factorization"

$= 2\cdot5\sqrt{5}$

$= 10\sqrt{5}$

$\sqrt[3]{500}$

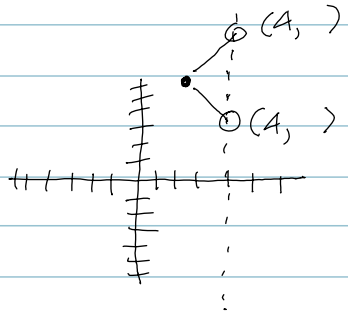
$\sqrt[4]{500}$

$\sqrt{2\cdot2\cdot5\cdot5\cdot5}$

$= 5\sqrt[3]{4}$

$\sqrt[4]{500}$

$(4, y)$
$(2, 7)$



$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$12 = \sqrt{(4-2)^2+(y-7)^2}$

$12 = \sqrt{4+(y-7)^2}$

$144 = 4+(y-7)^2$

$-4 \quad -4$

$140 = (y-7)^2$

$\pm\sqrt{140} = y-7$

$y = 7 \pm \sqrt{140}$

$2|140 \quad 2|70 \quad 5|35 \quad 7$

$y = 7 \pm 2\sqrt{35}$

$7+\sqrt{140}$

$7+11.8 = 18.8$

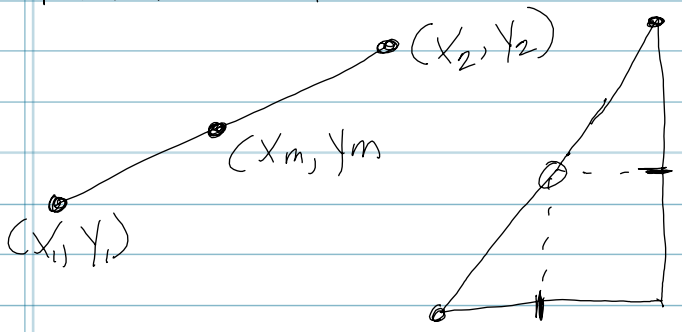
$7-\sqrt{140}$

$7-11.8 = -4.8$

★ $d = 12 \quad (2, 7) \quad (4, y)$

$(4, -4.8)$
$(4, 18.8)$

MIDPOINT



$(x_m, y_m) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$(5, -4)$
$(8, 12)$

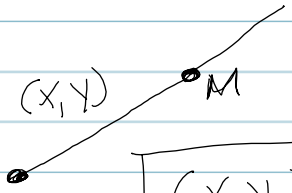
$= \left(\frac{5+8}{2}, \frac{-4+12}{2}\right)$

$= \left(\frac{13}{2}, \frac{8}{2}\right)$

$= \left(13/2, 4\right)$

Midpoint = $(-3, 5)$
Endpoint = $(2, -1)$

Find the other endpoint



$(x_m, y_m) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

(x, y)
$(2, -1)$

$(-3, 5) = \left(\frac{x+2}{2}, \frac{y-1}{2}\right)$

$-3 \qquad 5$

$\frac{x+2}{2} = -3 \qquad \frac{y-1}{2} = 5$

$x+2 = -6 \qquad y-1 = 10$

$x = -8 \qquad y = 11$

$(-8, 11)$