Class #45 - Fri Dec 17 :

- go thru the Final Exam
  - similar in format Exam #3
  - WebWork set: "MAT 1275 FINAL EXAM"
    - write up solution to the WW exercises

Final Exam Exercises

① Solving a quadratic equation by factoring and applying the zero product property.

(hint : use ac-method :

Ex : $2x^2 + 7x + 5 = 0$

$ax^2 + bx + c = 0$

find 2 factors of $ac = 2(5) = 10$ which sum to $b = 7$

[$5 \times 2 = 10$ and $5 + 2 = 7$]

$$2x^2 + \boxed{7x} + 5$$

$$= 2x^2 + \boxed{5x + 2x} + 5$$

$$= [2x^2 + 5x] + [2x + 5]$$

$$= x(2x+5) + 1(2x+5) = (x+1)(2x+5)$$

or : just set up the binomial factor and "fill in the blanks" .. $2x^2 + 7x + 5 = (2x+ \quad)(x+ \quad)$

Solve: $2x^2 + 7x + 5 = 0$

LHS. Factors: $(2x+5)(x+1) = 0$

By "zero product property":

$2x + 5 = 0$ or $x + 1 = 0$

#2/ "2×2 linear system"

(1) $y = \boxed{-3x-1}$

(2) $\boxed{y} = x + 3$

Solve this algebraically by "substitution":

Substitute "$y = -3x - 1$" from (1) into y in (2)

$\Longrightarrow \quad -3x - 1 = x + 3$

$\quad\;\; +3x \;\; -3 \qquad +3x \;\; -3$

(i) Solve for x: $\quad -4 = 4x \quad \Longrightarrow \quad \underline{\underline{x = -1}}$

(ii) Find y by plugging in $\underline{x = -1}$ into either of the 2 original equations:

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

$(-1, 2)$

Graph: (1) $y = -3x - 1$

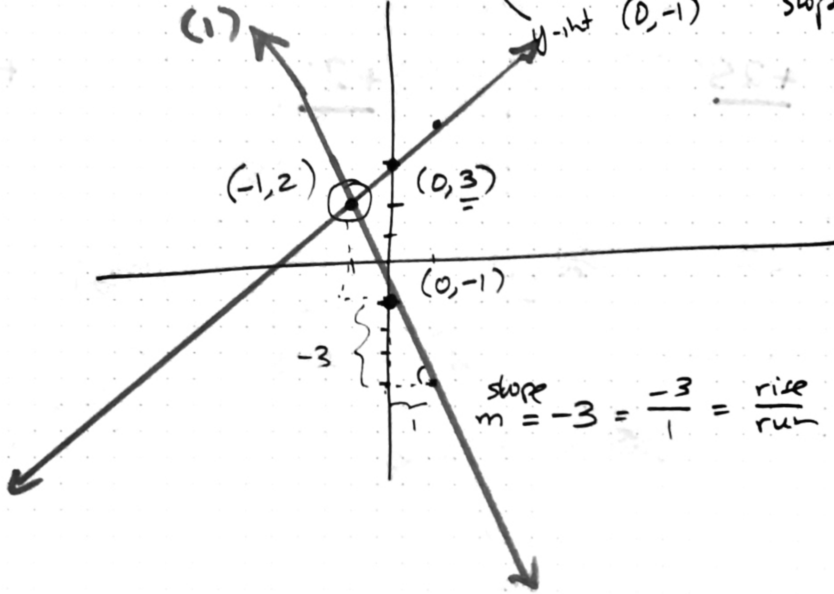
(2) $y = 1x + 3$

slope-intercept form:

$y = mx + b$

slope   y-int

y-int (0,−1)



slope

$m = -3 = \frac{-3}{1} = \frac{\text{rise}}{\text{run}}$

#3) Equation of a circle

$$x^2 - 10x + y^2 - 10y + 24 = 0$$

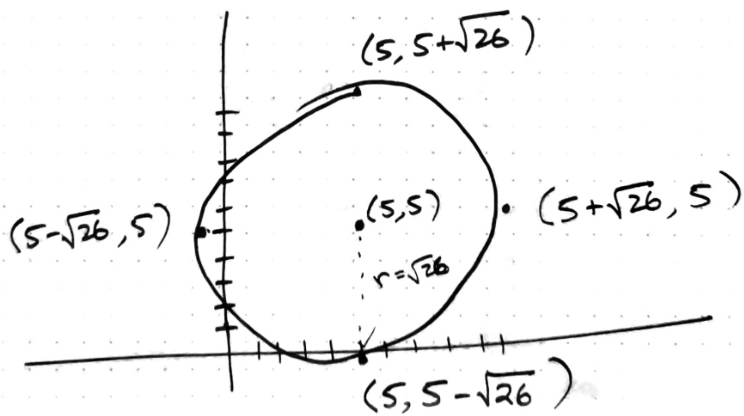
complete the squares! $\left(\frac{b}{2}\right)^2$

$$(x^2 - 10x + 25) + (y^2 - 10y + 25) = -24 + 25 + 25$$

$\left(\frac{-10}{2}\right)^2 = (-5)^2 = 25$ $\left(\frac{-10}{2}\right)^2 = (-5)^2 = 25$

$$(x - 5)^2 + (y - 5)^2 = \underbrace{26}_{r^2}$$

center: $(5, 5)$ radius $r = \sqrt{26} \approx 5.1$



"N, S, E, W"

#4: Solving a quadratic equation (using the quadratic formula).

$\cancel{x=}$ solutions of $ax^2+bx+c=0$

are $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$ =

#5/ Graphing a quadratic function:

Ex: $y = -(2x^2+24x+64)$

x-intercepts: Solve for x when $y=0$

$0 = -(\underbrace{2x^2+24x+64}_{\text{factor out } 2})$

$0 = -2(\underbrace{x^2+12x+32}_{\text{factor!}})$

$0 = -2(x+8)(x+4)$

$\Rightarrow \boxed{x=-8 \quad x=-4}$

$\boxed{(-8,0) \quad (-4,0)}$

y-int: Plug in $x=0$:

$\cancel{y=-(2\cdot 0^2+24}$

$y = -(2\cdot 0^2+24\cdot 0+64)$

$= -64$

y-int: $\boxed{(0,-64)}$

vertex ?

$$y = -(2x^2 + 24x + 64)$$
$$= \boxed{-2}x^2 \boxed{-24}x - 64$$

x-coord of vertex: $x = -\frac{b}{2a} = -\frac{(-24)}{2(-2)} = \frac{24}{-4} = -6$

y-coord of vertex: plug in $x=-6$ into the quadratic!

$$y = -2x^2 - 24x - 64$$

$x = -6 \Rightarrow y = -2(-6)^2 - 24(-6) - 64$

$$= -2(36) + 144 - 64$$
$$= \underbrace{-72 + 144}_{} - 64$$
$$= 72 - 64 = 8$$

$\therefore$ vertex: $(-6, 8)$

#6/ Complex number division : or "simplifying fractions"

$$\frac{2-3i}{\underbrace{-1-3i}_{\text{use the "complex conjugate" of the denominator}}} \cdot \frac{(-1+3i)}{(-1+3i)} =$$

#7 : Solving an exponential equation (using logarithms)

$$8^x = 4099$$

(1) Take the log of both sides (either "log" or "ln")

$$\log_{10}(8^x) = \log_{10}(4099)$$

(2) ★ Use the property of logarithms to "bring the variable down in front":

$$x(\log 8) = \log(4099) \implies x = \frac{\log 4099}{\log 8} =$$