

1. (3pts) Which of the points $A = (3, -1)$ and $B = (-2, 5)$ is closer to the point $C = (1, 2)$?

$$d(A, C) = \sqrt{(3-1)^2 + (-1-2)^2} = \sqrt{4+9} = \sqrt{13}$$

$$d(B, C) = \sqrt{(-2-1)^2 + (5-2)^2} = \sqrt{9+9} = \sqrt{18}$$

A is closer to C than B.

2. (4pts) Solve the inequality and illustrate the solution on the number line:

$$3 \leq \frac{4x-1}{2} \leq 6 \quad | \cdot 2$$

$$6 \leq 4x-1 \leq 12 \quad | +1$$

$$7 \leq 4x \leq 13 \quad | \div 4$$

$$\frac{7}{4} \leq x \leq \frac{13}{4}$$



$$x \in \left[\frac{7}{4}, \frac{13}{4} \right]$$

3. (4pts) Find the equation of the line that contains $(-2, 4)$ and is perpendicular to the line $3x - 2y = 6$.

Slope of $3x - 2y = 6$:

$$-2y = -3x - 6 \quad | \div (-2)$$

$$y = \frac{3}{2}x + 3$$

$$\text{slope} = \frac{3}{2}$$

Slope of perp. line is $-\frac{2}{3}$

$$y - 4 = -\frac{2}{3}(x - (-2))$$

$$y = -\frac{2}{3}x - \frac{4}{3} + 4$$

$$y = -\frac{2}{3}x + \frac{8}{3}$$

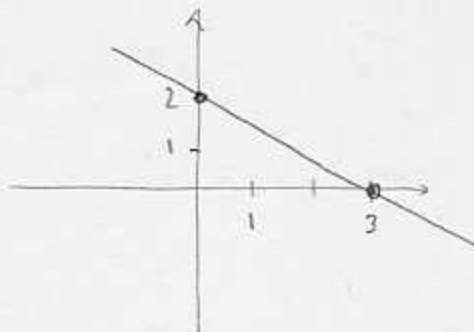
4. (4pts) Find the equation of the line whose x -intercept is 3 and whose y -intercept is 2. Draw a picture.

Line passes through $(3, 0)$ and $(0, 2)$

$$m = \frac{2-0}{0-3} = -\frac{2}{3}$$

$$y - 0 = -\frac{2}{3}(x - 3)$$

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



5. (2pts) Find the midpoint of the points (1, 3) and (3, -4).

$$M = \left(\frac{1+3}{2}, \frac{3-4}{2} \right) = \left(2, -\frac{1}{2} \right)$$

6. (4pts) Put the complex number into standard form:

$$\frac{3+i}{2-3i} = \frac{3+i}{2-3i} \cdot \frac{2+3i}{2+3i} = \frac{6+11i+3i^2}{2^2-(3i)^2} = \frac{3+11i}{13} = \frac{3}{13} + \frac{11}{13}i$$

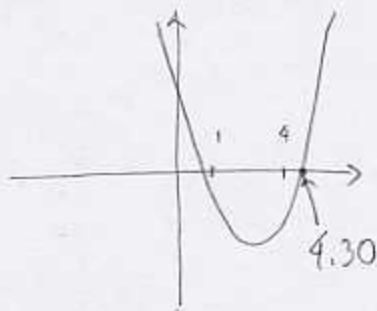
7. (7pts) The equation $y = x^2 - 5x + 3$ is given.

a) Use your calculator to accurately sketch the graph of the equation on paper. Indicate your viewing window.

b) Using your calculator, find the greatest x -intercept accurate to two decimal points.

c) Now find the greatest x -intercept algebraically, by solving a certain equation. Does your answer agree with b)?

a)



$$[-10, 10] \times [-10, 10]$$

c) $x^2 - 5x + 3 = 0$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4 \cdot 1 \cdot 3}}{2}$$

$$= \frac{5 \pm \sqrt{25 - 12}}{2}$$

$$= \frac{5 \pm \sqrt{13}}{2}$$

b) $x = 4.30$

The bigger solution is $\frac{5 + \sqrt{13}}{2} \approx 4.30$

8. (3pts) Solve for x :

$$a + 3x - bx + b = 2ax - 4a$$

$$3x - bx - 2ax = -4a - a - b$$

$$x(3 - b - 2a) = -5a - b$$

$$x = \frac{-5a - b}{3 - b - 2a} = \frac{5a + b}{2a + b - 3}$$

9. (5pts) Solve the equation:

$$\sqrt{2x^2 - 7} = x - 1 \quad |^2$$

$$2x^2 - 7 = x^2 - 2x + 1$$

$$x^2 + 2x - 8 = 0$$

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

$$x = -4, x = 2$$

Check:

$$\sqrt{2 \cdot 16 - 7} \stackrel{?}{=} -4 - 1 \quad \sqrt{2 \cdot 4 - 7} = 2 - 1$$

$$\sqrt{25} \stackrel{?}{=} -5$$

no

$$\sqrt{1} = 1$$

yes

only $x = 2$ is the solution

10. (4pts) Find the equation of the circle that contains the origin whose center is $(3, 4)$.

Sketch the circle.

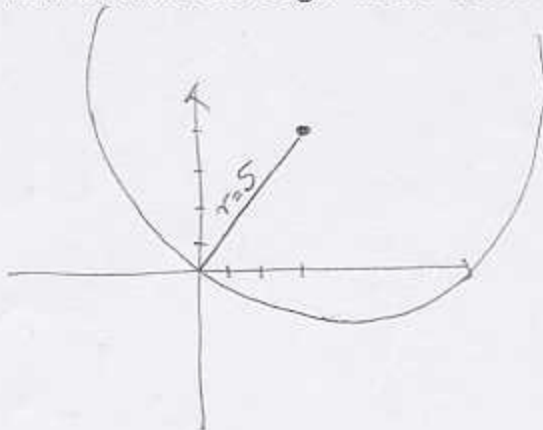
$$r = d((0, 0), (3, 4))$$

$$= \sqrt{(3-0)^2 + (4-0)^2}$$

$$= \sqrt{9+16} = 5$$

$$(x-3)^2 + (y-4)^2 = 25$$

eq. of circle



11. (4pts) An inheritance of \$10,000 is to be divided between Sean and George, with George to receive \$3,000 less than Sean. How much will each receive?

$x =$ amount that Sean receives
 $x - 3000 =$ " " " " George

$$x + (x - 3000) = 10000$$

Sean receives \$6,500.
 George receives \$3,500.

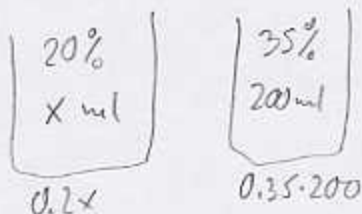
$$2x - 3000 = 10000$$

$$2x = 13000$$

$$x = 6,500$$

12. (6pts) How many milliliters of a 20% solution of hydrochloric acid needs to be added to 200ml of a 35% solution in order to get a 25% solution? Don't forget to write down what your variable means.

$x =$ amt. of 20% sol. in ml.



$$0.2x + 0.35 \cdot 200 = 0.25(x + 200)$$

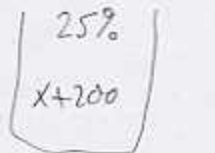
$$0.2x + 70 = 0.25x + 50$$

$$20 = 0.05x$$

$$\frac{20}{0.05} = x$$

$$x = 400 \text{ ml}$$

pure acid:

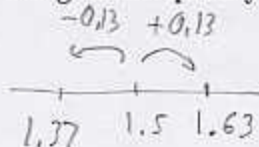


pure acid:

- Bonus (5pts) The actual voltage U of a 1.5-volt battery is allowed to differ from 1.5 volts by less than 0.13 volts. Express this fact using an inequality involving absolute value. Solve for U .

$$|U - 1.5| < 0.13$$

distance from U
to 1.5 < 0.13



$$1.37 < U < 1.63$$