Math 120 KAUST Worksheet 1 September 5th, 2018

Name:

Answer the questions in the spaces provided. Try to work through problems 1-5 on your own. For problem 6 feel free to work in groups. Don't hesitate to ask me or your peers for help, this is not a quiz.

1. Unit Conversion.

(a) Convert 3 hours, 25 minutes and 2 seconds into seconds.

$3 \text{ hrs}\left(\frac{60 \text{ min}}{1 \text{ hr}}\right)\cdot\left(\frac{60 \text{ sec}}{1 \text{ min}}\right) = 10800 \text{ secs}$

$25 \text{ mins}\left(\frac{60 \text{ sec}}{1 \text{ min}}\right) = 1500 \text{ secs}$

$2 \text{ secs}$

$12302$

(b) Which is faster: 100 miles per hour or 150 feet per second?

$100\frac{\text{miles}}{\text{hr}}\left(\frac{5280 \text{ ft}}{1 \text{ mile}}\right)\left(\frac{1 \text{ hr}}{3600 \text{ sec}}\right) = 146.67\frac{\text{ft}}{\text{sec}}$

150 ft/sec faster.

(c) How many $mm^2$ are there in one $km^2$?

$1 \text{ km}^2 = 1 \text{km}\cdot\text{km}\left(\frac{10^6 \text{ mm}}{1 \text{ km}}\right)\left(\frac{10^6 \text{ mm}}{1 \text{ km}}\right)$

$= 10^{12} \text{ mm}^2$

2. Algebra practice.

(a) Solve for $t$: $3t - 7 = 7 - 11t$.

$14t = 14$

$t = 1$

(b) Solve for $x$: $\frac{2}{x} = \frac{1}{x+1}$

$2x + 2 = x$

$x = -2$

(c) Solve for $z$: $z^2 - 5z = 6$

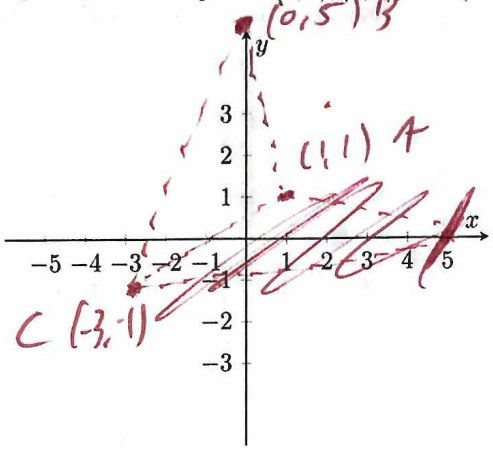
$z^2 - 5z - 6 = 0$

$(z - 6)(z + 1) = 0$

$z = 6$ or $z = -1$

3. The distance formula

(a) On the following coordinate plane, label the points $(1,1)$, $(0,5)$, and $(-3,-1)$.




(b) Compute the distance between each pair of points.

$$D(A,B) = \sqrt{(0-1)^2+(5-1)^2} = \sqrt{1+16} = \sqrt{17}$$

$$D(B,C) = \sqrt{(-3-0)^2+(-1-5)^2} = \sqrt{9+36} = \sqrt{45}$$

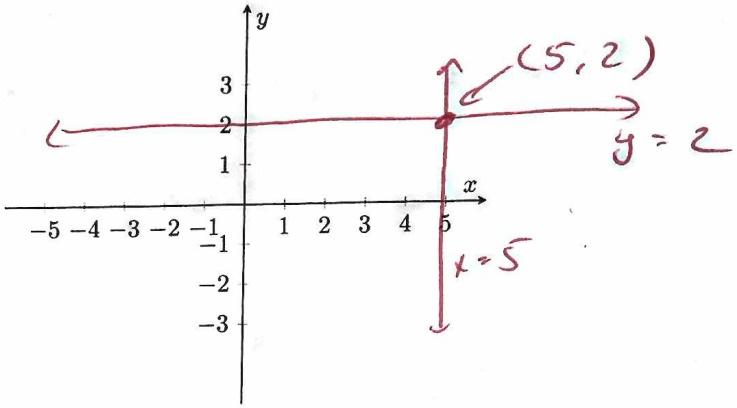
$$D(C,A) = \sqrt{(1-(-3))^2+(1-(-1))^2} = \sqrt{16+4} = \sqrt{20}$$

(c) What is the perimeter of the triangle connecting these 3 points?

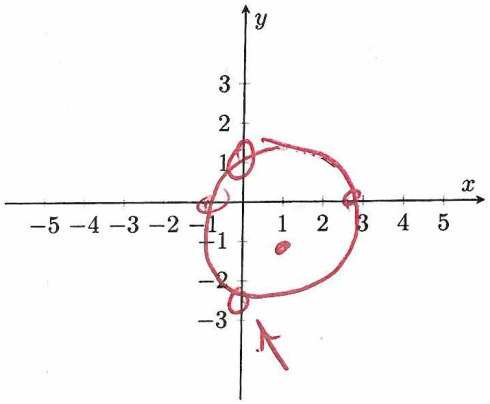
$$\sqrt{17}+\sqrt{45}+\sqrt{20}$$

4. Graphing curves

(a) Graph the line corresponding to the equation $x = 5$. On the same axis, graph the line corresponding to the equation $y = 2$. What are the coordinates of their point of intersection?




(b) Graph the circle corresponding to the equation $(x-1)^2 + (y+1)^2 = 4$.




(c) What are the points on the circle where the $x$-coordinate is 0?

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

$(y+1)^2 = 3$

$y+1 = \pm\sqrt{3}$

$y = -1 \pm \sqrt{3}$

$(0, \sqrt{3}-1) = (0, .73)$

$(0, -\sqrt{3}-1) = (0, -2.73)$.

5. Linear Modelling

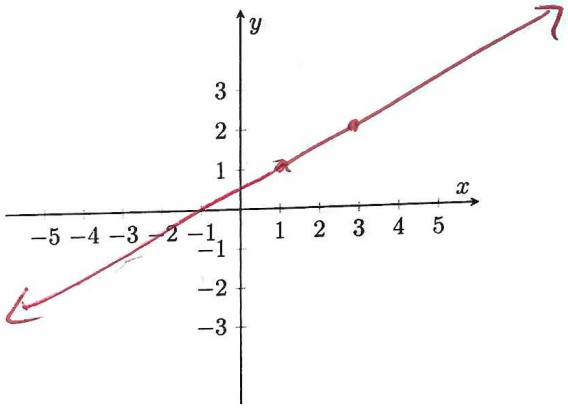
(a) Suppose a line contains the points $(1,1)$ and $(3,2)$. What is the equation of this line?

$m = \frac{\Delta y}{\Delta x} = \frac{2-1}{3-1} = \frac{1}{2}$

pt slope $y = \frac{1}{2}(x-1)+1$

or $y = \frac{1}{2}x + \frac{1}{2}$

(b) Draw a graph of this line.




(c) Does this line intersect the origin? (That is, the point $(0,0)$).

No | e.g. graph or e.g. $0 \neq \frac{1}{2}$

(d) What is the $x$-coordinate of the line when the $y$-coordinate is 25.

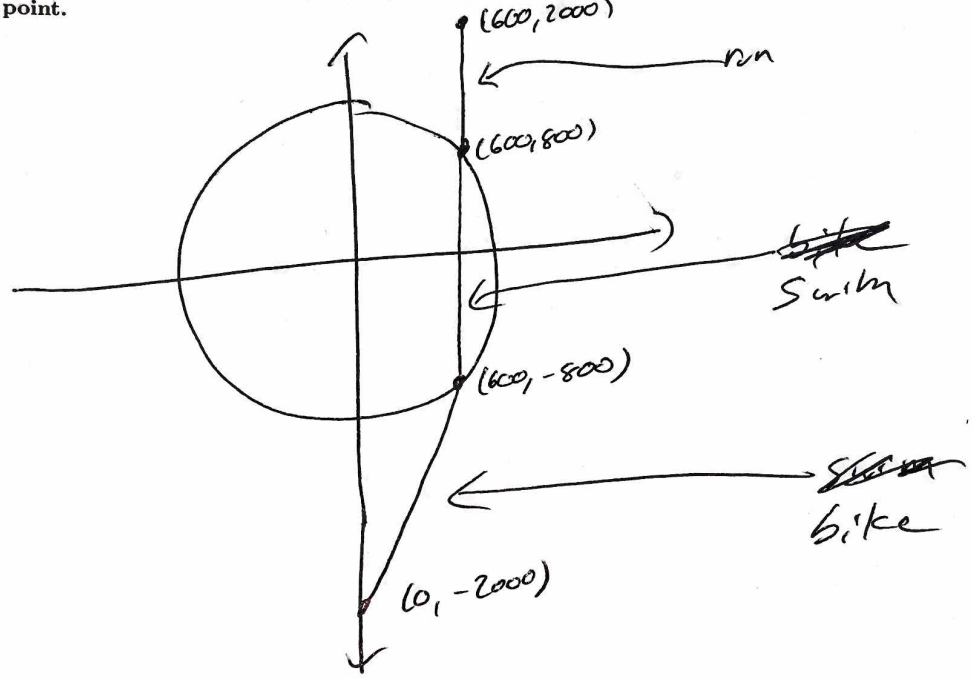
$25 = \frac{1}{2}x + \frac{1}{2}$

$\frac{1}{2}x = \frac{49}{2}$

$x = 49$

6. Jerry and Bobby are racing in a triathlon, a race where competitors run, the swim, and then bike. It takes place near a circular lake of radius equal to 1000 meters. The race begins 600 meters east and 2000 meters north of the center of the lake. Competitors run due south, until they reach the lake. They then enter the water and swim due south until they reach the opposite shore. Finally, the bike in a straight line towards a point 2000 meters due south of the center lake.

(a) Choose a coordinate system and draw a picture. Label the points where the race starts and ends, as well as where the competitors enter and exit the lake. **Include explicit coordinates for each labeled point.**




(b) Compute the distance the competitors have to run, the distance they have to swim, and the distance they have to bike, rounding to one decimal place.

Bike = $\sqrt{600^2 + 1200^2}$ = 1341.64

Distance Running: 1200
Distance Swimming: 1600
Distance Biking: 1341.64

| Event | Bobby's Time | Jerry's Time |
|---|---|---|
| Run | 200 | 240 |
| Swim | 800 | 533.3 |
| Bike | 89.44 | 111.80 |

(c) Bobby is a faster runner and a faster biker. His running speed is 6 m/s, and his biking speed is 15 m/s. Jerry's running speed is 5 m/s and his biking speed is 12 m/s. Jerry, on the other hand, is a faster swimmer, swimming at 3 m/s while Bobby swims at 2 m/s. Compute how long each competitor spends at each event, filling in the table above.

Use $d = rt \Rightarrow t = \frac{d}{r}$

Run

Bobby: $\frac{1200}{6} = 200$

Jerry: $\frac{1200}{5} = 240$

Swim

Bobby: $\frac{1600}{2} = 800$

Jerry: $\frac{1600}{3} = 533.3$

Bike

Bobby: $\frac{1341.64}{15} = 89.44$

Jerry: $\frac{1341.64}{12} = 111.80$

(d) Compute each competitors final times. Who won the race?

B: $200 + 800 + 89.44 = 1089.44$

J: $240 + 533.33 + 111.80 = 885.13$

Jerry wins