Name: Key

Collab #1 Due: Wednesday, April 6

58

Collab #1 Handout for Math 1A

Instructions: As a group of 2 or 3, discuss how to do the following problems. On this paper (only continuing on a separate sheet of paper if absolutely necessary), write the answer to each problem showing all work in getting to the solution. Box the solution.

1. Define a function. Discuss a function's domain and range.

A relation, a set of ordered pairs, where every value in the
2 domain has only one value in the range. The domain are the
independent values and the range are the dependent values.
Typically x's are used for independent and y's are used for dependent. Independent values are chosen & dependent values are a result.

2. For the function, $f(x) = -2x^2 + 18$ do the following:

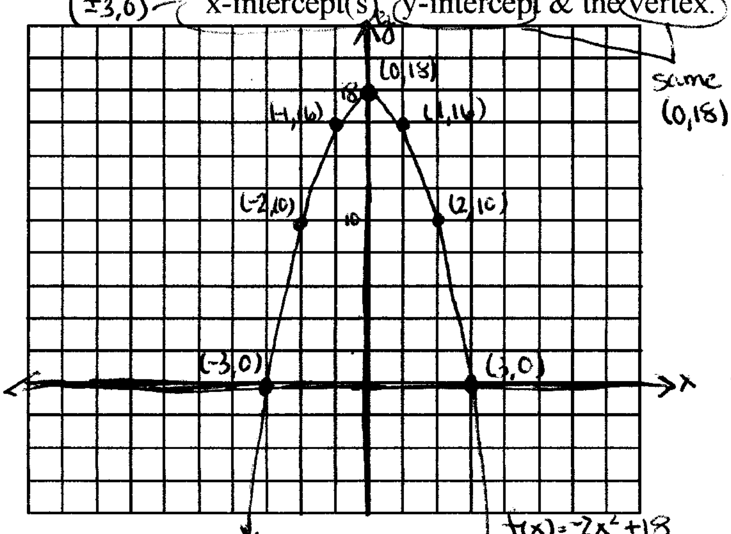
a) Graph f(x) on your calculator & sketch it on your paper showing the ($\pm 3,0$) x-intercept(s), y-intercept & the vertex.

Let $x=0 \Rightarrow y=-2(0)^2+18=0$ is y-int

Let $y=0 \Rightarrow 0=-2x^2+18 \Rightarrow 9=x^2 \Rightarrow x=\pm 3$ x-int.

same (0,18)

5



b) What is the shape of the graph?

parabola

c) What type of function is this?

quadratic / 2nd Degree

d) Use your calculator to find f(4)

- Plug in f(x) to Y=
- Use table menu to set table start at 4
- f(4) = -14

vertex of a parabola
$x = -b/2a = \frac{-0}{2(-2)} = 0$
$y = f(-b/2a) = -2(0)^2+18$
or $y = a(x-h)^2+k$
$y = -2(x-0)^2+18$

e) Use your calculator to find the value(s) of x for which f(x) = 17

$x \approx 0.7$ & -0.7 Use the $\boxed{\text{trace}}$ to find the intercept, & approx or $\boxed{\text{table}}$ ask for y!

3. How do you identify a vertical & horizontal intercept? How can you interpret them?

A vertical intercept is where a graph crosses the y-axis. It is where x=0.
3 A horizontal intercept is where a graph crosses the x-axis. It is where y=0.
The vertical intercept is the baseline; the amount present when there is no independent. The horizontal intercept can be interpreted in many ways. For 2 linear equations set equal, it is a break-even point. For any equation interpreted only when x & y are positive, it is the amount of independent to produce zero for depend.

10

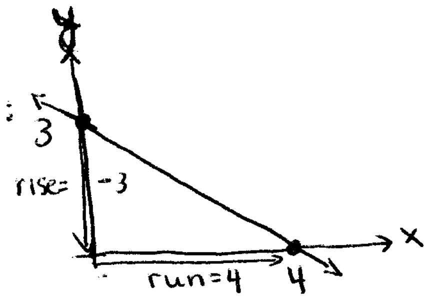
4. What is the slope of a linear function? How can it be interpreted in terms of independent and dependent variables?

The slope is the ratio of the change in the dependent to the
2 change in the independent. It is the rate at which the
dependent variable changes with respect to the independent variable.

5. Name 3 ways to find the slope and give an example.

(1) Visual/Geometric Approach Example:

$m = \frac{\text{rise}}{\text{run}} = \frac{-3}{4}$



6 (2) Equation in Slope-Intercept Form Example:

$y = mx + b$

$y = \left(\frac{-2}{5}\right)x + \frac{9}{5}$ The slope is num coeff of x

$2x + 5y = 9$

$-2x \quad -2x$

$\frac{5y}{5} = \frac{-2x}{5} + \frac{9}{5}$

(3) From 2 points $m = \frac{y_2 - y_1}{x_2 - x_1} = \left(\frac{10}{3}\right)$ $\frac{\Delta y}{\Delta x} = m$ Example: A line goes thru $(0,5)$ & $(3,15)$ Find the line's slope. $m = \frac{15-5}{3-0} = \frac{10}{3}$

6. Give the point-slope form of a line and use it to give the equation of the line through the points (-2, 5) & (3, -1) in slope-intercept form.

Point-Slope Form: $y - y_1 = m(x - x_1)$ where m = slope, (x_1, y_1) is a pt on line

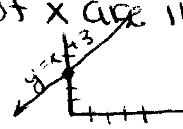
2 $m = \frac{-1-5}{3-(-2)} = \frac{-6}{5} \Longrightarrow y - (-1) = \frac{-6}{5}(x-3) \Rightarrow y + 1 = \frac{-6}{5}x + \frac{18}{5} - \frac{5}{5} \Rightarrow \boxed{y = \frac{-6}{5}x + \frac{13}{5}}$

or $y - (5) = \frac{-6}{5}(x - (-2)) \Rightarrow y - 5 = \frac{-6}{5}x + \frac{-12}{5} + \frac{25}{5} \Rightarrow y = \frac{-6}{5}x + \frac{13}{5}$ same

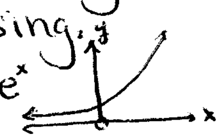
7. What does it mean for a function to be increasing? Draw a picture of any increasing function.

A function is increasing when the values of y are
2 increasing as the values of x are increasing.

Ex. $y = x + 3$



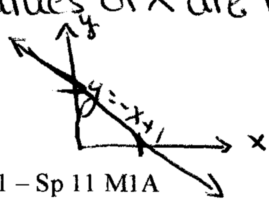
$y = e^x$



8. What does it mean for a function to be decreasing? Draw a picture of any decreasing function.

2 A function is decreasing when the values of y are
decreasing as the values of x are increasing.

Ex. $y = -x + 1$



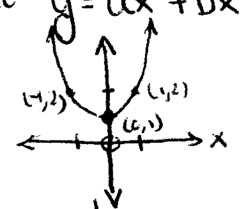
$y = e^{-x}$

14

9. For each of the following types of equations sketch a graph and give an example equation.

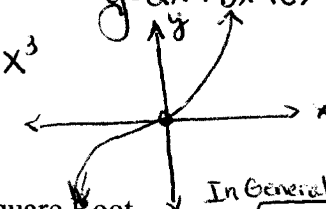
a) Quadratic In General: $y = ax^2 + bx + c$ $a,b,c \in \mathbb{R}$ $a \neq 0$

$y = x^2 + 1$



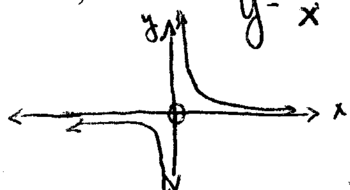
b) Cubic In General: $y = ax^3 + bx^2 + cx + d$ $a,b,c,d \in \mathbb{R}$ $a \neq 0$

$y = x^3$



12

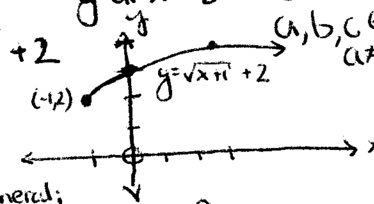
c) Inverse $y = \frac{1}{x}$ $x \neq 0$



d) Square Root In General: $y = a\sqrt{x-b} + c$ $a,b,c \in \mathbb{R}$ $a \neq 0$

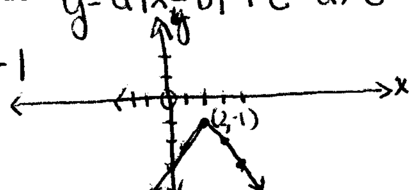
$y = \sqrt{x+1} + 2$

D: $\{x \mid x \geq -1\}$



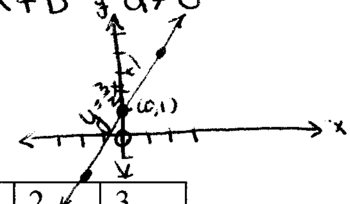
e) Absolute Value In General: $y = a|x-b| + c$ $a \neq 0$

$y = -|x-2| - 1$



f) Linear In General: $y = ax + b$, $a \neq 0$

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



10. For the table of values:

t	-3	-2	-1	0	1	2	3
y = f(t)	16	96	144	160	144	96	16

a) Sketch a graph of the function

b) come up with a formula, using function notation to denote it. Show exactly how you come up with the equation.

c) How would the process change in getting the answer for part b) if you were not given the point where t=0?

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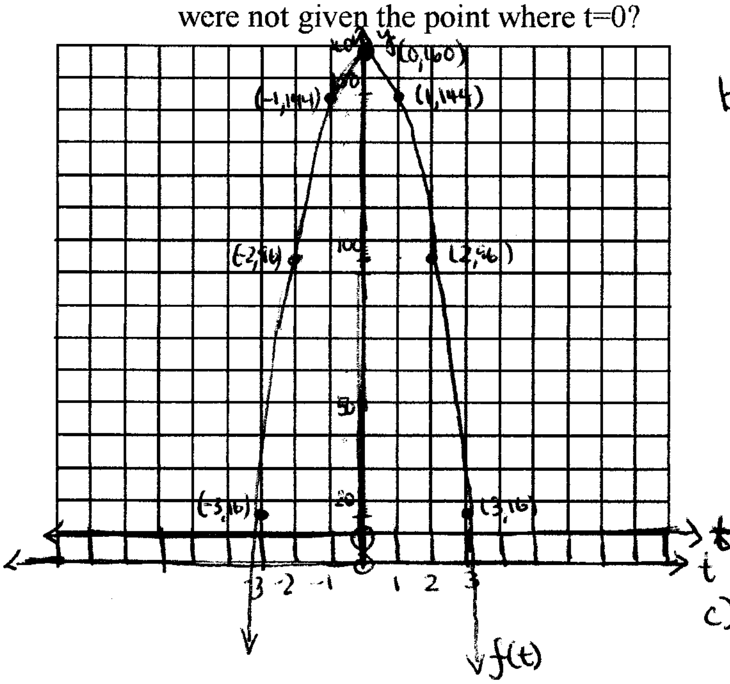


b) $y = -a(x-0)^2 + 160$

$144 = -a(1)^2 + 160$

$-16 = -a \therefore a = 16$

$96 = -a(2)^2 + 160$

$-64 = -4a \therefore a = 16$

$y = -16x^2 + 160$

c) The process would be much more difficult & we'd have to use a specialized formula since we wouldn't have the vertex.

15

11. Tickets for a concert go on sale, and 100 tickets sell immediately. The tickets then sell at a rate of 20 per day. If N represents the total number of tickets sold t days after going on sale, answer the following questions.

a) Make a table for $t = 0, 1, \ldots, 5$

t	0	1	2	3	4	5
N	100	120	140	160	180	200

b) Find a formula for N as a function of t.

4 $N = 20t + 100$

c) What is the vertical intercept? What does this mean in context of the problem?

The vertical intercept is 100.
It is the number of tickets sold immediately.

d) What is the slope? What does this mean in context of the problem?

The slope is 20.
It is the rate of tickets sold per day.

12. Factor the following polynomials:

a) $25x^2 - 81$ Diff of 2 Sq.
$a^2 = 25x^2$ $b^2 = 81$ $a^2 - b^2 = (a+b)(a-b)$
$a = 5x$ $b = 9$
$= \boxed{(5x-9)(5x+9)}$

b) $49x^2 - 56x + 16$ PST
$a^2 = 49x^2$ $b^2 = 16$ $a^2 \pm 2ab + b^2$
$a = 7x$ $b = 4$ $= (a \pm b)^2$
$2ab = 56x$
$= \boxed{(7x-4)^2}$

3 c) $x^2 + 9x + 14$ Trinomial w/ Leading Coeff. of 1
same sign, ↑ sum
$14 = 7 \cdot 2$ or $2 \cdot 7$ sum to 9
$= (x+7)(x+2)$

13. What do you have to remember to do in your calculator before dealing with Trig functions?

1 Change the mode from degrees to radians or vice versa dependent upon values.

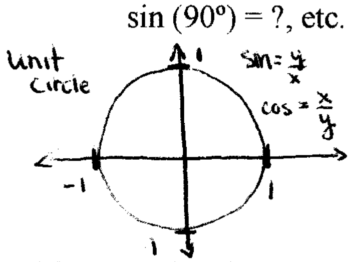
14. Convert the following degree measures to radians:

3 a) 90° $\frac{90^\circ}{1} \cdot \frac{\pi}{180^\circ} = \boxed{\frac{\pi}{2}}$

b) 180° $180^\circ \cdot \frac{\pi}{180^\circ} = \boxed{\pi}$

c) 270° $270 \cdot \frac{\pi}{180} = \boxed{\frac{3\pi}{2}}$

15. Give the values for sine and cosine of the measures in #14. Give your answers as: sin (90°) = ?, etc.



$\sin 90^\circ = \sin(\pi/2) = 1$ $\cos(90^\circ) = \cos(\pi/2) = 0$

6 $\sin 180^\circ = \sin(\pi) = 0$ $\cos(180^\circ) = \cos(\pi/2) = -1$

$\sin 270^\circ = \sin(3\pi/2) = -1$ $\cos(3\pi/2) = \cos(3\pi/2) = 0$

16. Rationalize the following denominators:

2 a) $\frac{\sqrt{7}}{\sqrt{x} + 2} \cdot \frac{\sqrt{x+2}}{\sqrt{x+2}} = \boxed{\frac{\sqrt{7(x+2)}}{x+2} \text{ or } \frac{\sqrt{7x+14}}{x+2}}$

b) $\frac{7}{x - \sqrt{2}} \cdot \frac{x+\sqrt{2}}{x+\sqrt{2}} = \boxed{\frac{7x+7\sqrt{2}}{x^2-2}}$

Just remember $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$!!

19