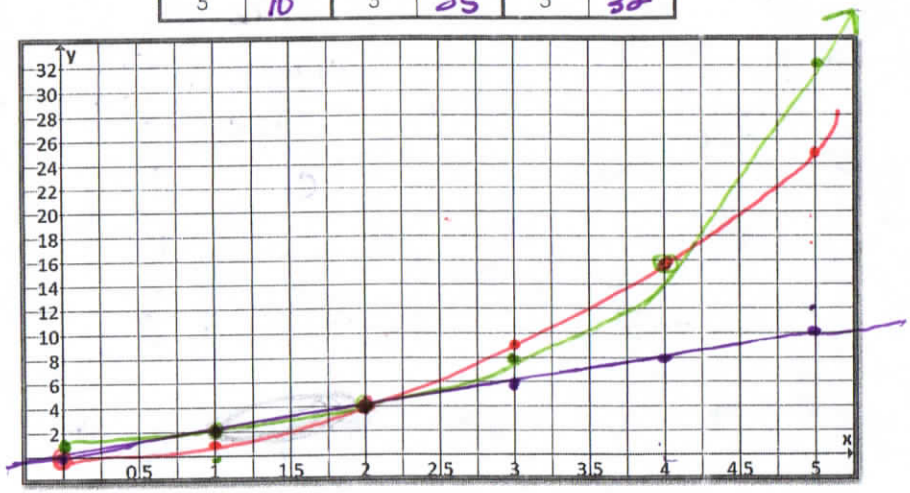
Day 2 – Comparing Graphs and Tables of Functions

For the following functions, create a table and graph each function in a different color.

x	$y_1 = 2x$	x	$y_2 = x^2$	x	$y_3 = 2^x$
0	0	0	0	0	1
1	2	1	1	1	2
2	4	2	4	2	4
3	6	3	9	3	8
4	8	4	16	4	16
5	10	5	25	5	32



Looking at the graphs above:

a) Which function shows a constant rate of change in its y values? How is this displayed on your graph?

linear : $y = 2x$

Line

b) Which function is largest between $1 < x < 2$? How is this displayed on your graph?

Linear ; Exponential (1, 2) (2, 4)

c) Eventually, which type of function shows the most rapid rate of growth in its y values? How is this displayed on your graph?

Exponential

(4, ∞) ROC / growth will be greater

* Exponential have the greatest ROC across the entire domain *

Scenario 2: Consider the following equations: $f(x) = 5x^2 + 4$ and $g(x) = 2^x$.

x	F(x)	G(x)
0	4	1
1	9	2
2	24	4
3	49	8
4	84	16
5	129	32
6	184	64
7	249	128
8	324	256
9	409	512
10	504	1024

a. As x increases, will the value of f(x) always be greater than the value of g(x)?

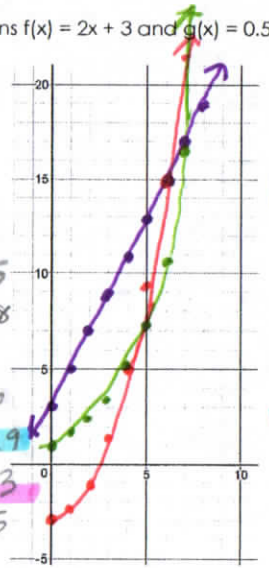
No @ $x = 9$ $g(x)$ is greater than $f(x)$

b. Will an exponential function eventually always succeed a quadratic function?

yes.

Scenario 3: Consider the equations $f(x) = 2x + 3$ and $g(x) = 0.5x^2 - 3$ and $h(x) = 1.5^x$.

x	F(x)	G(x)	H(x)
0	3	-3	1.
1	5	-2.5	1.5
2	7	-1	2.25
3	9	1.5	3.375
4	11	5	5.0625
5	13	9.5	7.5938
6	15	15	11.391
7	17	21.5	17.086
8	19	29	25.629
9	21	37.5	38.443
10	23	47	57.665



a. Will the growth rate of g(x) ever exceed the growth rate of f(x)?

@ $x = 9$

b. Will the growth rate of h(x) ever exceed the growth rate of f(x)?

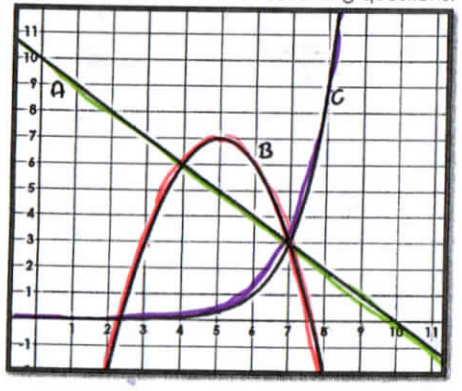
@ $x = 8$

c. Will the growth rate h(x) ever exceed the growth rate of g(x)?

@ $x = 9$

Important Takeaway
The graphs and tables of a function increasing Exponentially will ALWAYS eventually exceed a function increasing linearly or Quadratically

Scenario 4: Use the graph below to answer the following questions:



a. Which function has the largest x-intercept? A

b. Which function has the largest y-intercept? A

c. List the functions in order from smallest to biggest when x = 2:
B C A

d. List the functions in order from smallest to biggest when x = 5:
C A B

e. List the functions in order from smallest to biggest when x = 7:
Equal

f. List the functions in order from smallest to biggest when x = 9:
B A C

g. List the functions in order from smallest to biggest when x = 15:
B A C

h. Which functions have a positive rate of change throughout the entire graph? C

i. Which functions have a negative rate of change throughout the entire graph? A

j. Which graph has a rate of change that is negative and positive? B

k. Which function has the largest ROC from [3, 5]?

A: (3, 7), (5, 5) → $\frac{5-7}{5-3} = \frac{-2}{2} = -1$

B: (3, 3), (5, 7) → $\frac{7-3}{5-3} = \frac{4}{2} = 2$

C: (3, 0), (5, 1/2) → $\frac{1/2-0}{5-3} = \frac{\frac{1}{2}}{3} = \frac{1}{6} \approx .167$

l. Which function has the largest ROC from [7, 8]?

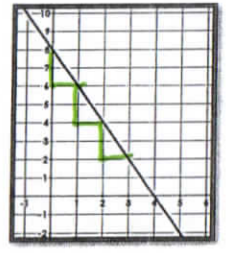
A: (7, 3), (8, 2) → $\frac{2-3}{8-7} = \frac{-1}{1} = -1$

B: (7, 3), (8, -2) → $\frac{-2-3}{8-7} = \frac{-5}{1} = -5$

C: (7, 3), (8, 9) → $\frac{9-3}{8-7} = \frac{6}{1} = 6$

Scenario 5: Consider the following:

f(x)



$y = -2x + 8$

g(x)

x	g(x)	
−2	−10	
−1	−8	+2
0	−6	+2
1	−4	+2

$y = 2x - 6$

a. Write an equation for each representation.

b. Compare the y-intercepts and rates of changes for both functions:
y int: f(x) greater
ROC: Equal

Scenario 6: Consider the following representations:

a. f(x)

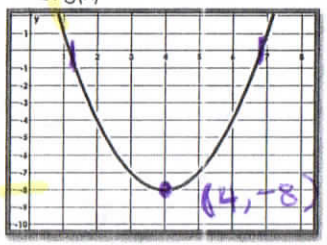
x	-4	-3	-2	-1	0	1
y	0	-5	-8	-9	-8	-5

V: (-1, -9)

↑

Min/Max Value

b. g(x)



a. Which quadratic function has the smaller minimum value? Explain why.

f(x)

b. Which quadratic function has the bigger y-intercept? Explain why.

f(x)

c. Name the x-intercepts for each function (estimate if necessary):

f(x): (-4, 0) (2, 0)

g(x): (1, 0) (7, 0)