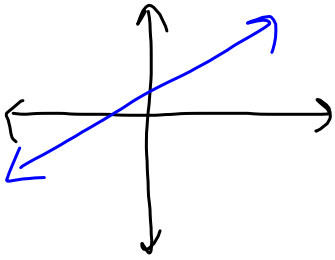
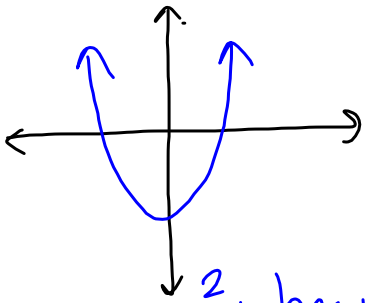
Sec. 9.7 Linear, Quadratic, and Exponential Models



Linear

$y = mx + b$

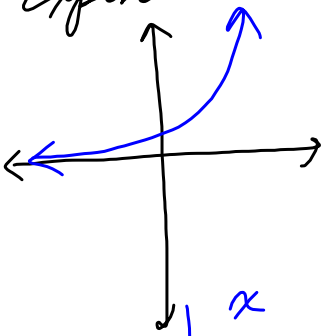
first differences



Quadratic

$y = ax^2 + bx + c$

second differences



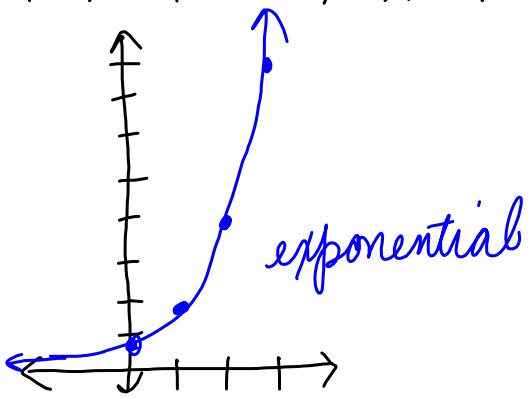
Exponential

$y = ab^x$

common ratio

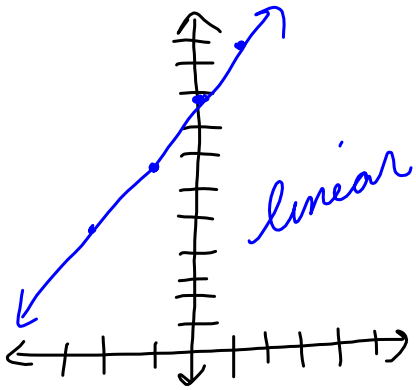
Problem 1: What model is most appropriate for graphing each set of points?

a. $(0,1), (1,2), (2,4), (3,8)$



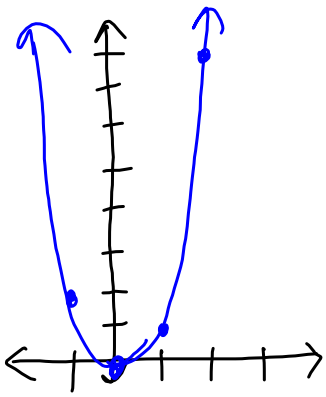
exponential

b. $(-2,5), (-1,7), (0,9), (1,11)$



linear

c. $(-1,2), (0,0), (1,2), (2,8)$



quadratic

Problem 2: Use differences or ratios to determine which kind of function best models the data. Write an equation to model the data.

a.

x	y	1st	2nd
0	0		
		0.25	
1	0.25		0.5
		0.75	
2	1		0.5
		1.25	
3	2.25		0.5
		1.75	
4	4		

quadratic
$y = ax^2 + bx + c$

b. $\Delta x = 1$

x	y	1st diff
-2	-6	4
-1	-2	4
0	2	4
1	6	4
4.2	10	

$b = 2$ slope $m = 4$

linear: $y = mx + b$
$y = 4x + 2$

c.

x	y	ratio
-1	0.5	×2
0	1	×2
1	2	×2
2	4	×2
3	8	

$a = 1$ $b = 2$

exponential
$y = ab^x$
$y = 2^x$

Problem 3: Write the equation which models the data.

Value of a Painting

Years	Value ($)	Ratio
0	3200	
		1.05
1	3360	
		1.05
2	3528	
		1.05
3	3704	
		1.05
4	3890	
		1.05
5	4084	

$y = 3200(1.05)^x$

Year	Number of Frogs
0	120
	0.84
1	101
	0.85
2	86
	0.84
3	72
	0.83
4	60

$y = 120(0.84)^x$

a.

x	y	1st	2nd
0	0		
		0.25	
1	0.25		0.5
		0.75	
2	1		0.5
		1.25	
3	2.25		0.5
		1.75	
4	4		

$c=0$

quadratic

$y = ax^2 + bx + c$ ($c = 0$)

$$y = \frac{1}{4}x^2$$

$1 = a(2)^2 + b(2) + 0$

$1 = 4a + 2b$

$4 = a(4)^2 + b(4)$

$4 = 16a + 4b$

$-2(1 = 4a + 2b)$

$1 = 4\left(\frac{1}{4}\right) + 2b$

$1 = 1 + 2b$

$-1 \quad -1$

$\frac{0}{2} = \frac{2b}{2}$ $b = 0$

$4 = 16a + 4b$ ($+0$)

$-2 = 8a - 4b$

$\frac{2}{8} = \frac{8a}{8}$

$a = \frac{1}{4}$