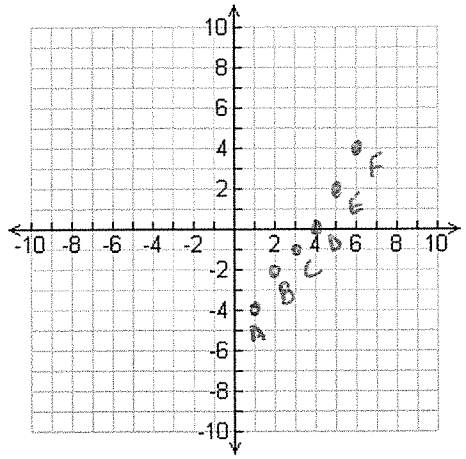
Unit 3: Comparing Functions - Modeling & Transformations

PRE-TEST

Graph the given set of data on the given coordinate plane.
Then identify if the information follows a linear, exponential, or quadratic model.

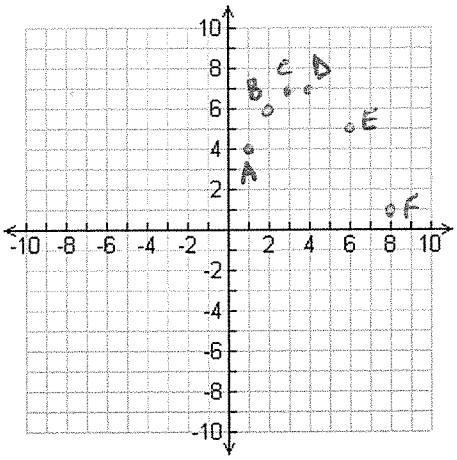
1. $(1,-4),(2,-2),(3,-1),(4,0),(5,2),(6,4)$
A B C D E F



Points go in a line so...

Linear.

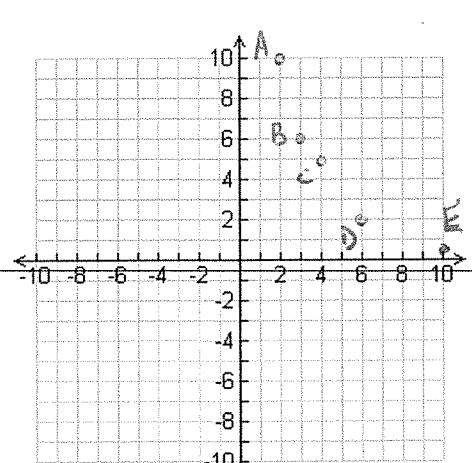
2. $(1,4),(2,6),(3,7),(4,7),(6,5),(8,1)$
A B C D E F



Form an upside-down U so

Quadratic.

3. $(2,10),(3,6),(4,5),(6,2),(10,\frac{1}{2})$
A B C D E



Arcs downward (could be upward) so...

Exponential

Rewrite the given equation applying the given transformation:

4. $y = 4x$; translated down 5 units, and reflected over the x-axis.

$y = -4x - 5$

Neg 4 since reflected; minus 5 since down.

5. $y = 3(2)^x$; translated 3 units to the left, and up 6 units.

$y = 3(2)^{x+3} + 6$

Remember opposite left & Right, +6 since up.

6. $y = -\frac{1}{2}x^2$; translated 8 units to the right, and down 4 units.

$y = -\frac{1}{2}(x-8)^2 - 4$

opposite in ( ) w/ the x since right, − 4 since down.

In this section you are given some points on the line of best fit from an ungiven scatter plot. Use the given points to find the equation of the line:

7. Linear:

(2, 4) and (−6, 8)
x_1 y_1 x_2 y_2

$m = \frac{8-4}{-6-2} = \frac{4}{-8} = -\frac{1}{2}$

$y = mx + b$

$\boxed{y = -\frac{1}{2}x + 5}$

Choosing...

(2, 4)

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

$4 = -1 + b$
$+1 \quad +1$

$5 = b$

(−6, 8)

$8 = -\frac{1}{2}(-6) + b$

$8 = 3 + b$
$-3 \quad -3$

$5 = b$

8. Exponential:

(−3, 162) and (1, 2)

$\frac{162}{b^{-3}} = \frac{ab^{-3}}{b^{-3}}$

Using Exp. Properties

$162b^3 = a$

Plug into other Eqn.

$2 = ab^1$

$2 = 162b^3 \cdot b^1$

$\frac{2}{162} = \frac{162b^4}{162}$

$\sqrt[4]{\frac{1}{81}} = \sqrt[4]{b^4}$

$\boxed{b = \frac{1}{3}}$

So...

$162\left(\frac{1}{3}\right)^3 = a$

$162\left(\frac{1}{27}\right) = a$

$6 = a$

$\boxed{y = 6\left(\frac{1}{3}\right)^x}$

9. Quadratic:

(2, 5), (−1, −28), and (6, −35)

$5 = a(2)^2 + b(2) + c$

$5 = 4a + 2b + c$

$-28 = a(-1)^2 + b(-1) + c$

$-28 = a - b + c$

Solve for c

$-28 - a + b = c$

$-35 = a(6)^2 + b(6) + c$

$-35 = 36a + 6b + c$

$5 = 4a + 2b - 28 - a + b$

$5 = 3a + 3b - 28$

$+28 \qquad +28$

$\frac{33}{3} = \frac{3a}{3} + \frac{3b}{3}$

$11 = a + b$

$-a \quad -a$

$11 - a = b$

$11 - (-3) = b$

$14 = b$

$-28 - (-3) + 14 = c$

$-28 + 3 + 14 = c$

$-25 + 14 = c$

$-11 = c$

$-35 = 36a + 6b - 28 - a +$

$-35 = 35a + 7b - 28$

$+28 \qquad +28$

$\frac{-7}{7} = \frac{35a}{7} + \frac{7b}{7}$

$-1 = 5a + b$

$-1 = 5a + 11 - a$

$-1 = 4a + 11$

$-11 \qquad -11$

$\frac{-12}{4} = \frac{4a}{4}$

$-3 = a$

So...

$$y = -3x^2 + 14x - 11$$