

7.1 Exploring Quadratic Relations

Gummy bears and Frogs Activity

Review

Functions: A specific type of relation that occurs when each element in the domain is only associated with one element in the range. Graphically we can decide if a relation is a function by using the vertical line test.

Types of Relations:

Linear Relation (line)

$y = mx + b$ (slope-intercept form) OR $ax + by = c$ (standard form) OR $ax + by + c = 0$ (general form)

- The exponent on the x variable is 1 (1st degree polynomial)

Quadratic Relation (parabola)

$y = ax^2 + bx + c$, where $a \neq 0$ (standard form) $y = a(x-p)^2 + q$, where $a \neq 0$ (vertex form)

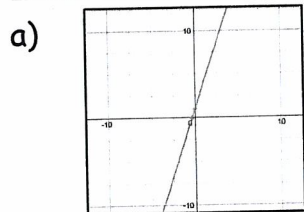
- The largest power of x is 2 (2nd degree polynomial)

- Why can $a \neq 0$?

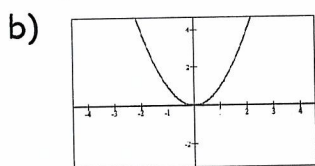
$y = 0x^2 + bx + c$

$y = bx + c \rightarrow$ The equation would change to linear

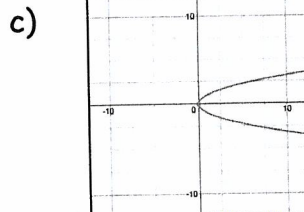
EXAMPLE #1: Which of the following relations are functions?



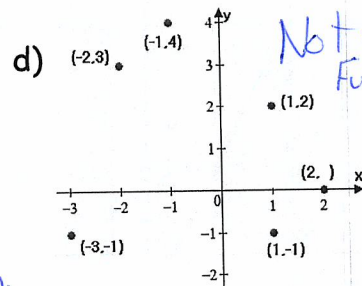
Function



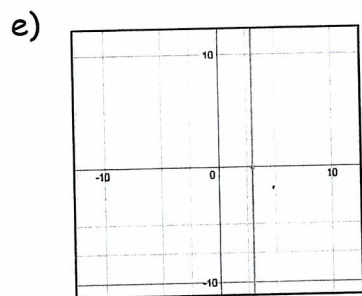
Function



Not a function.



Not a Function



Not a Function

g) $\{(6, 3), (1, 7), (12, 10), (5, 3)\}$

Function

h) $\{(4, 2), (5, 7), (4, 6), (9, 15)\}$

Not a Function.

EXAMPLE #2: Which of the following are quadratic? Why?

a) $f(x) = 7x^2$

Yes

b) $f(x) = 5x + 8$

No

c) $y = (x+2)(x-1) = x^2 - 1x + 2x - 2 = x^2 + 1x - 2$

Yes

d) $f(x) = 2x(x-3) = 2x^2 - 3x$

Yes

e) $f(x) = 3x^2 + 7x + 8$

Yes

f) $y = 4x^3 - 3x^2$

No

g) $y = x(x-6)^2$

No

$x(x-6)(x-6)$
 $(x^2-6x)(x-6)$
 $x^3-6x^2-6x^2+36x$

h) $g(x) = 6(x+3)^2 + 8 = 6(x+3)(x+3) + 8$

Yes.

$= (6x+18)(x+3) + 8$
 $= 6x^2 + 18x + 18x + 54 + 8$
 $= 6x^2 + 36x + 64$

EXAMPLE #3: Given quadratics in the form $y = ax^2 + bx + c$, find the values of a, b, and c.

a) $y = 7x^2 + 4x - 2$ $a = \underline{7}$, $b = \underline{4}$, $c = \underline{-2}$

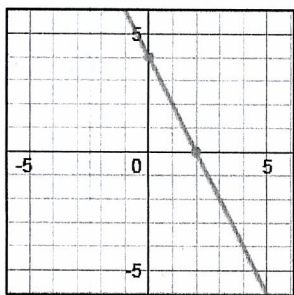
b) $y = \frac{1}{3}x^2 - 5x + 1$ $a = \underline{\frac{1}{3}}$, $b = \underline{-5}$, $c = \underline{1}$

c) $y = x^2 + 3x$ $a = \underline{1}$, $b = \underline{3}$, $c = \underline{0}$

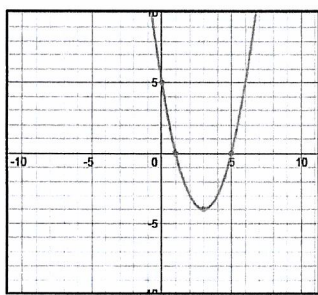
d) $f(x) = -\frac{2}{7}x^2 + 8$ $a = \underline{-\frac{2}{7}}$, $b = \underline{0}$, $c = \underline{8}$

e) $y = -x^2$ $a = \underline{-1}$, $b = \underline{0}$, $c = \underline{0}$

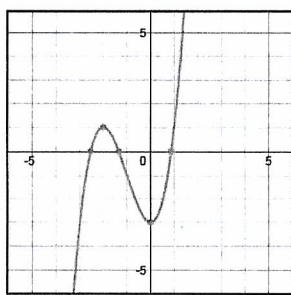
EXAMPLE #4: Which of the following are quadratic?



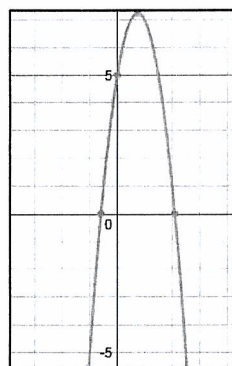
No



Yes



No



Yes.