Nonlinear Functions

Goal: Graph nonlinear functions

Vocabulary

Nonlinear function: | Any function whose graph is not a line or part of a line

Vertical line test: | A test used to tell whether the graph of a relation represents a function
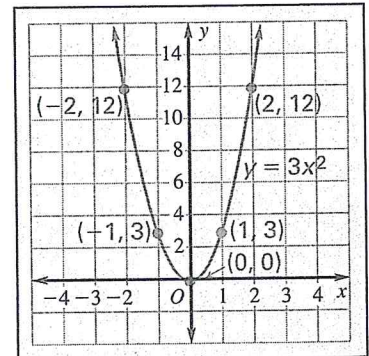
EXAMPLE 1 Graphing a Quadratic Function

Graph the function $y = 3x^2$ using a table of values.

Solution

Make a table of values for the function. Then graph the ordered pairs and connect the points with a smooth curve.

1. Substitute x-values into $y = 3x^2$ to make a table.

x	y
−2	$3(\boxed{-2})^2 = \boxed{12}$
−1	$3(\boxed{-1})^2 = \boxed{3}$
0	$3(\boxed{0})^2 = \boxed{0}$
1	$3(\boxed{1})^2 = \boxed{3}$
2	$3(\boxed{2})^2 = \boxed{12}$

**2.** Graph the ordered pairs and connect the points.

EXAMPLE 2 Using the Graph of a Quadratic Function

Tiling Sam is installing ceramic tile flooring in a dining room. Ceramic tile costs $4 per square foot. The function $y = 4s^2$ models the total cost of tiling a square floor with side lengths of s feet. Graph the function. Estimate the side lengths of the floor if the total cost of tiling is $676.

Solution

1. Make a table of values for the function. Then make a graph.

s	y
0	$4(\boxed{0})^2 = \boxed{0}$
4	$4(\boxed{4})^2 = \boxed{64}$
8	$4(\boxed{4})^2 = \boxed{576}$
12	$4(\boxed{12})^2 = \boxed{576}$
16	$4(\boxed{16})^2 = \boxed{1024}$
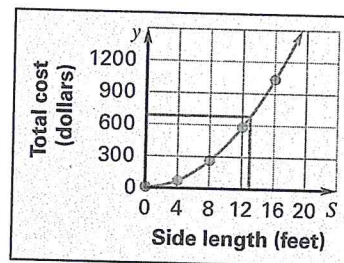
2. Use the graph. It appears that the total cost of tiling is $676 when the side length is $\boxed{13 \text{ feet}}$.
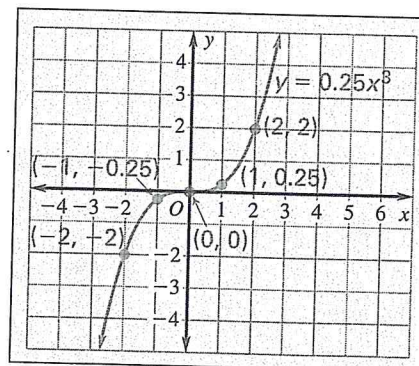
EXAMPLE 3 **Graphing a Cubic Function**

Graph the function $y = 0.25x^3$ using a table of values.

Solution

Make a table of values for the function. Then graph the ordered pairs and connect the points with a smooth curve.

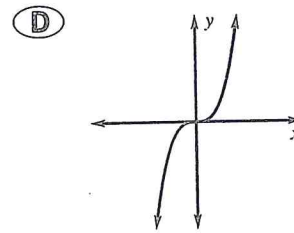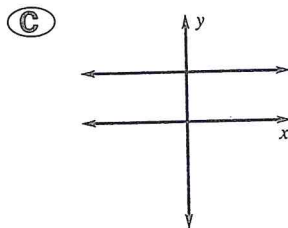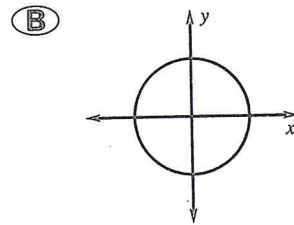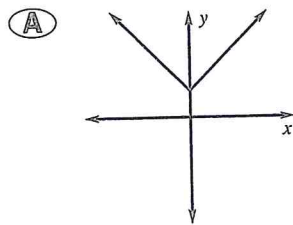| x	y
−2	$0.25(\boxed{-2})^3 = \boxed{-2}$
−1	$0.25(\boxed{-1})^3 = \boxed{-0.25}$
0	$0.25(\boxed{0})^3 = \boxed{0}$
1	$0.25(\boxed{1})^3 = \boxed{0.25}$
2	$0.25(\boxed{2})^3 = \boxed{2}$

1. $y = -\frac{1}{3}x^2$ **2.** $y = -2x^3$ **3.** $y = \frac{3}{4}x^3$

EXAMPLE 4 **Multiple Choice Practice**

Which black graph does not represent a function?

Ⓐ

Ⓑ

Ⓒ

Ⓓ

Solution

Because no vertical line intersects the graphs in choices $\boxed{A}$, $\boxed{C}$, and

$\boxed{D}$ at more than one point, these graphs represent $\boxed{\text{functions}}$. A vertical

line intersects the graph in choice B at more than one point. So, the graph

$\boxed{\text{does not represent}}$ a function.

Answer: The correct answer is $\boxed{B}$.   Ⓐ   Ⓑ   Ⓒ   Ⓓ