DIFFERENCES AND RATIOS A table of values represents a linear function if the *differences* of successive y-values are all equal. A table of values represents an exponential function if the *ratios* of successive y-values are all equal. In both cases, the increments between successive x-values need to be equal.

Linear function: $y = 3x + 5$

x	−1	0	1	2
y	2	5	8	11

Differences: 5 − 2 = 3 3 3

Exponential function: $y = 0.5(2)^x$

x	−1	0	1	2
y	0.25	0.5	1	2

Ratios: $\frac{0.5}{0.25} = 2$ 2 2

You can use differences to tell whether a table of values represents a quadratic function, as shown.

CHECK VALUES OF x

When deciding what function is represented by a table of values, be sure that the values of x are increasing by the same amount.

Quadratic function: $y = x^2 - 2x + 2$

x	−1	0	1	2	3
y	5	2	1	2	5

First differences: −3 −1 1 3

Second differences: 2 2 2

First find the differences of successive *y*-values, or *first differences*.

Then find the differences of successive first differences, or *second differences*.

The table of values represents a quadratic function if the second differences are all equal.

EXAMPLE 2 Identify functions using differences or ratios

Use differences or ratios to tell whether the table of values represents a *linear function*, an *exponential function*, or a *quadratic function*.

a.

x	−2	−1	0	1	2
y	−6	−6	−4	0	6

First differences: 0 2 4 6

Second differences: 2 2 2

▶ The table of values represents a quadratic function.

b.

x	−2	−1	0	1	2
y	−2	1	4	7	10

Differences: 3 3 3 3

▶ The table of values represents a linear function.

GUIDED PRACTICE for Examples 1 and 2

1. Tell whether the ordered pairs represent a *linear function*, an *exponential function*, or a *quadratic function*: (0, −1.5), (1, −0.5), (2, 2.5), (3, 7.5).

2. Tell whether the table of values represents a *linear function*, an *exponential function*, or a *quadratic function*.

x	−2	−1	0	1
y	0.08	0.4	2	10