# Chapter 4 Test

**1.** Sketch a graph for each parabola. Label the coordinates of the vertex and the equation of the axis of symmetry.

  **a)** $y = -3x^2 - 4$

  **b)** $y = -2(x - 1)^2 + 3$

  **c)** $y = \frac{1}{4}(x + 5)^2 - 2$

**2.** Sketch a graph for each relation. Label the *x*-intercepts and the vertex.

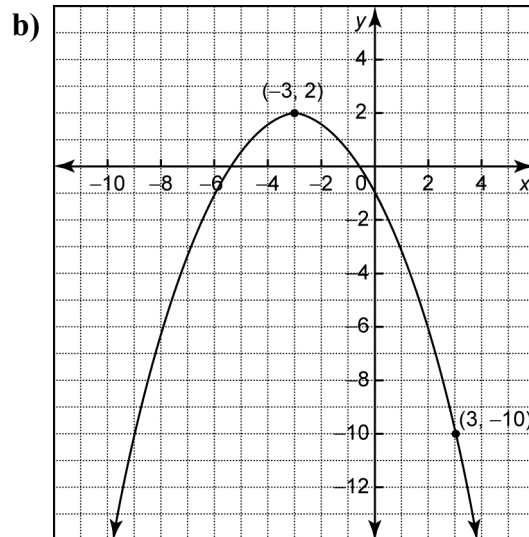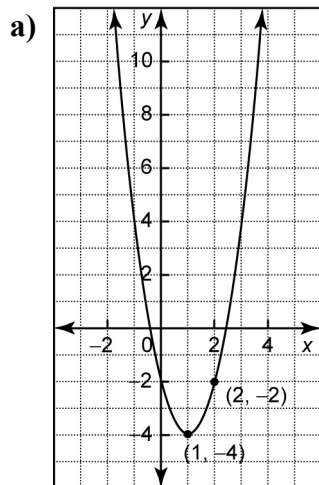  **a)** $y = -5(x - 5)(x + 1)$

  **b)** $y = 2(x + 3)(x - 4)$

**3.** Evaluate

  **a)** $2^2 - 2^0 + 2^{-2}$

  **b)** $(2^2)^{-2}$

  **c)** $(3^0 - 4^0 + (-3)^{-2})^0$

  **d)** $(3^0 - 4^0 + (-3)^{-2})^{-1}$

**4.** Determine an equation to represent each parabola.

  **a)**



**b)**



**5.** Use finite differences to determine whether each relationship is linear, quadratic, or neither.

**a)**

| x | y |
|---|---|
| −5 | 17 |
| −4 | 7 |
| −3 | 1 |
| −2 | −1 |
| −1 | 1 |

**b)**

| x | y |
|---|---|
| −1 | −1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 8 |
| 3 | 27 |

**c)**

| x | y |
|---|---|
| 2 | 26 |
| 4 | 33 |
| 6 | 40 |
| 8 | 47 |
| 10 | 54 |

**6.** The table shows the growth pattern of a circular oil spill in calm water as oil spills out of the ruptured tank of a tanker. The spill began at time $t = 0$.

| Time, $t$ (h) | Radius, $r$ (m) | Area, $A$ (m$^2$) |
|---|---|---|
| 0 | 2.3 | 16.6 |
| 1 | 3.1 | 30.2 |
| 2 | 4.0 | 50.2 |
| 3 | 4.7 | 69.4 |
| 4 | 5.5 | 95.0 |
| 5 | 6.3 | |
| 6 | 7.3 | |
| 7 | 7.8 | |
| 8 | 8.9 | |

**a)** Complete the Area column using the formula $A = \pi r^2$. Round your answers to the nearest tenth.

**b)** Make a scatter plot of the data in the first two columns. Draw a line or curve of best fit.

**c)** Make a scatter plot of the data in the first and third columns. Draw a line or curve of best fit.

**d)** Use your graph in part b) to determine the radius of the oil spill after 10 h. Then, use the formula $A = \pi r^2$ to find the area at this time.

**e)** Use your graph in part c) to determine the area after 10 h. Then, compare this area with the area you calculated in part d).

**7.** Lucy throws a stone from the top of a cliff into the water below. The height $h$, in metres, of the stone after $t$ seconds is given by the relation $h = -4.9t^2 + 5t + 100$.

**a)** Sketch a graph of the quadratic relation.

**b)** Describe the flight path of the stone.

**c)** Find the maximum height of the stone.

**d)** How long does it take the stone to reach this maximum height?

**8.** A parabola $y = ax^2 + k$ passes through the points $(1, 3)$ and $(2, -3)$. Find the values of $a$ and $k$.

**9.** The half-life a radioactive material is 3 weeks. Determine the mass of 500 mg of the material that is still radioactive after

**a)** 6 weeks

**b)** 12 weeks

**c)** 18 weeks

**10.** The path of a ball as it travels through the air after being fired out of a cannon can be modelled by the equation $h = -0.05d(d - 220)$, where $h$ is the height, in metres, above the ground and $d$ is the horizontal distance, in metres.

**a)** Sketch a graph of the relation.

**b)** At what horizontal distance does the ball land?

**c)** At what horizontal distance does the ball reach its maximum height?

**d)** What is the maximum height?