

Quadratic Functions in Vertex Form Review

Answer key Final answers only. Try first, then check.

CORE SKILLS

- K1** a) 12, 3, 0, 3, 12
 b) $a = -\frac{1}{2}$
 c) $y = -4x^2$, $y = 2x^2$, $y = 0.5x^2$, $y = -0.25x^2$

- K2** a) Vertex $(-3, -4)$; axis $x = -3$
 b) Vertex $(5, 1)$; opens down; y -intercept -49
 c) $y = 3(x + 4)^2 - 2$

- K3** a) $y = 2(x - 2)^2 + 3$
 b) $y = -2(x + 1)^2 + 4$
 c) $y = \frac{1}{2}(x + 4)^2$

- K4** a) $y = (x + 4)^2 - 5$; vertex $(-4, -5)$
 b) $y = 3(x - 3)^2 - 2$; vertex $(3, -2)$
 c) $y = -2(x + 3)^2 + 5$; vertex $(-3, 5)$

- K5** a) $y = (x - 5)(x + 3)$; zeros 5 and -3
 b) Vertex $(1, -16)$; $y = (x - 1)^2 - 16$
 c) $y = 2x^2 - 12x + 10$; $y = 2(x - 1)(x - 5)$

REAL WORLD

- A1** a) 7 m, at $t = 1$ s
 b) $t = 2$ s
 c) The model predicts 9.2 m at $t = 1.2$ s, but the ball hits the 9 m ceiling at $t = 1$ s ($g(1) = 9$), so it never reaches 9.2 m and the model stops applying after $t = 1$ s.
- A2** a) $R(p) = -4(p - 60)^2 + 14\,400$
 b) \$13 500
 c) $R(130) = -5200$: revenue can't be negative. The model reaches 0 at \$120, so above \$120 no passes are sold, the revenue is \$0, and the model no longer applies.
- A3** a) $h(x) = -0.5(x - 6)^2 + 8$; 8 m, at 6 m from the lamp post
 b) $h(x) = -0.5(x - 2)(x - 10)$; 8 m wide
 c) No: the arch is 8 m high at its centre, but at the float's edges ($x = 3.8$ and $x = 8.2$) it is only 5.58 m high, lower than the 6 m top.

THINK IT THROUGH

- T1** a) $y = -13$, not -4 : the axis $x = -3$ is right, but the minimum value is wrong.
 b) Adding 9 inside the bracket adds $2 \cdot 9 = 18$, so 18 must be subtracted: $y = 2(x + 3)^2 - 13$.
 c) $y = 2(x + 3)^2 + 2$: the constant is 15 more, so the parabola is translated 15 units up.
- T2** a) e.g. $y = -3(x + 2)^2 + 5$ (any $a < -1$)
 b) $y = -2(x - 3)^2 + 8$
 c) e.g. $y = -(x - 1)^2 - 2$ (maximum -2 , no zeros); two zeros when $k > 0$

BOSS LEVEL

- Boss**
- a) $PQ^2 = 5x^2 - 32x + 53$
 - b) $PQ^2 = 5(x - 3.2)^2 + 1.8$; $Q(3.2, 6.4)$; shortest distance $\sqrt{1.8} \approx 1.34$
 - c) 1.5, longer than 1.34; slope of $PQ = -\frac{1}{2}$, and $-\frac{1}{2} \times 2 = -1$
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