

Quadratic Functions Review

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

CORE SKILLS

- K1** a) Vertex $(-3, 5)$; axis $x = -3$; opens down
b) -13
c) Zeros 1 and -5 ; axis $x = -2$; vertex $(-2, -27)$

- K2** a) $y = (x - 5)^2 - 7$; minimum -7 at $x = 5$
b) $y = 2(x + 3)^2 - 11$; minimum -11 at $x = -3$
c) $y = -3(x - 2)^2 + 7$; maximum 7 at $x = 2$

- K3** a) $7\sqrt{3}$
b) $11 - 6\sqrt{2}$
c) $3 + \sqrt{5}$

- K4** a) $x = 5$ or $x = -3$
b) $x = -3 \pm \sqrt{13}$
c) $x = \frac{2 \pm \sqrt{10}}{2}$

- K5** a) $y = -\frac{1}{2}(x + 2)(x - 4)$
b) $y = -2(x - 1)^2 + 3$
c) $(1, -1)$ and $(3, 1)$

REAL WORLD

- A1** a) $R(x) = (2.50 + 0.25x)(160 - 8x) = -2x^2 + 20x + 400$
b) \$3.75 per muffin; \$450 per day
c) None: $R(x) = 500$ gives $x^2 - 10x + 50 = 0$, whose discriminant is $-100 < 0$. The most this model allows is \$450 a day.

- A2** a) $d^{-1}(x) = \sqrt{200x}$; input: a braking distance in m; output: the speed in km/h
b) $d^{-1}(32) = 80$ km/h, so yes: 10 km/h over the limit
c) $v = 80$ or $v = -80$. Only 80 km/h: a speed can't be negative, so -80 is outside the domain $v \geq 0$. That restriction is also what makes d^{-1} a function.

- A3** a) $(50, 10)$: 50 m out and 10 m up
b) 12.5 m, at $x = 25$ m
c) No. At $x = 40$ the ball is 16 m high, but the tree stands on the hill at 8 m, so its top is at 18 m: the ball hits the tree 2 m below the top.

THINK IT THROUGH

- T1** a) $f(1) = 0$, and the student's formula gives 5, not 1: it does not undo f .
b) Wrong root: the outputs of f^{-1} must be ≤ 3 , so $f^{-1}(x) = 3 - \sqrt{\frac{x+8}{2}}$. Domain and range not swapped: $D = [-8, \infty)$, $R = (-\infty, 3]$.
c) $f^{-1}(10) = 0$; $f(0) = 2(9) - 8 = 10$
- T2** a) e.g. $y = 5$, which meets the graph at $(0, 5)$ and $(4, 5)$
b) $k = -4$; tangent at $(3, 2)$
c) $k < -4$

BOSS LEVEL

- Boss**
- a) $y = (x - k)^2 + k - 6$; the vertices $(k, k - 6)$ lie on $y = x - 6$
 - b) $k < 6$
 - c) $k = 2$ (intercepts 0 and 4)
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