

Quadratic Functions and Graphs: math test solutions, Grade 9 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Features of a parabola

/ 3 pts

a. $a = 1$, $b = -8$, $c = 12$; opens up because $a > 0$. (1 pt)

b. $x = -\frac{-8}{2} = 4$. (1 pt)

c. $y = 16 - 32 + 12 = -4$: vertex $(4, -4)$, minimum value -4 . (1 pt)

2 Solving by factoring

/ 4 pts

a. Numbers with product -35 and sum 2: 7 and -5 . $(x + 7)(x - 5) = 0$ (1 pt), so $x = -7$ or $x = 5$ (1 pt).

b. Numbers with product 24 and sum -11 : -3 and -8 . $(x - 3)(x - 8) = 0$ (1 pt), so $x = 3$ or $x = 8$ (1 pt).

3 Reading a vertex form

/ 3 pts

- a. Vertex $(3, 18)$; $a = -2 < 0$, so it opens down. (1 pt)
- b. $f(0) = -2(9) + 18 = 0$: the y -intercept is $(0, 0)$. (1 pt)
- c. $-2(x - 3)^2 + 18 = 0$ gives $(x - 3)^2 = 9$, so $x - 3 = \pm 3$ and $x = 0$ or $x = 6$. (1 pt)

4 Transformations and equations

/ 4 pts

- a. Shift left 2 and down 3, and shrink vertically by a factor of $\frac{1}{2}$ (wider). (1 pt) The vertex is $(-2, -3)$. (1 pt)
- b. $y = a(x - 1)^2 + 4$. Substitute $(3, 0)$: $0 = 4a + 4$, so $a = -1$ (1 pt). The equation is $y = -(x - 1)^2 + 4$ (1 pt).

5 Reading a graph

/ 3 pts

- a. $A(-1, 0)$, $B(5, 0)$, $V(2, 9)$, $C(0, 5)$ (1 pt). The axis of symmetry is $x = 2$, halfway between A and B .
- b. The parabola opens down and passes through C : $5 = a(1)(-5)$, so $a = -1$ (1 pt). Then $y = -(x + 1)(x - 5) = -x^2 + 4x + 5$ (1 pt).

6 A stone off a bridge

/ 3 pts

- a. $t = -\frac{16}{2(-16)} = 0.5$ second. (1 pt)
- b. $h(0.5) = -4 + 8 + 20 = 24$ feet. (1 pt)
- c. Solve $-16t^2 + 16t + 20 = 0$, that is $4t^2 - 4t - 5 = 0$ (0.5 pt).
 $t = \frac{4 + \sqrt{96}}{8} \approx 1.72$ seconds; the negative root is rejected (0.5 pt).



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