

Structure, Identities and Modeling with Equations

Grade 11 – Algebra 2 math · Test Answer Key · Standards: A-SSE.A.1, A-SSE.A.2, A-CED.A.1, A-CED.A.2, A-CED.A.3, A-CED.A.4, A-REI.D.11, A-APR.C.5, N-CN.C.8, N-CN.C.9

Each answer shows the method and a scoring guide. Give partial credit for a correct setup with an arithmetic slip, and add the points for a total out of 20.

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Question 1 Factor completely (2 points)

$$(x^2 + 16)(x^2 - 16) = (x^2 + 16)(x + 4)(x - 4).$$

Scoring: 1 point for the first difference of squares, 1 point for the complete factoring.

Question 2 Rearrange formulas (2 points)

a. $9C/5 = F - 32$, so $F = 9C/5 + 32$.

b. $v^2 - u^2 = 2as$, so $a = (v^2 - u^2)/(2s)$.

Scoring: 1 point each.

Question 3 Binomial expansion (3 points)

Row 4: 1, 4, 6, 4, 1. $x^4 + 4x^3(-2) + 6x^2(4) + 4x(-8) + 16 = x^4 - 8x^3 + 24x^2 - 32x + 16$.

Scoring: 1 point for the coefficients, 1 point for the powers of -2 , 1 point for the final answer.

Question 4 Complex factoring (2 points)

a. $(x + 7i)(x - 7i)$.

b. $x = (6 \pm \sqrt{(36 - 100)})/2 = (6 \pm 8i)/2 = 3 \pm 4i$.

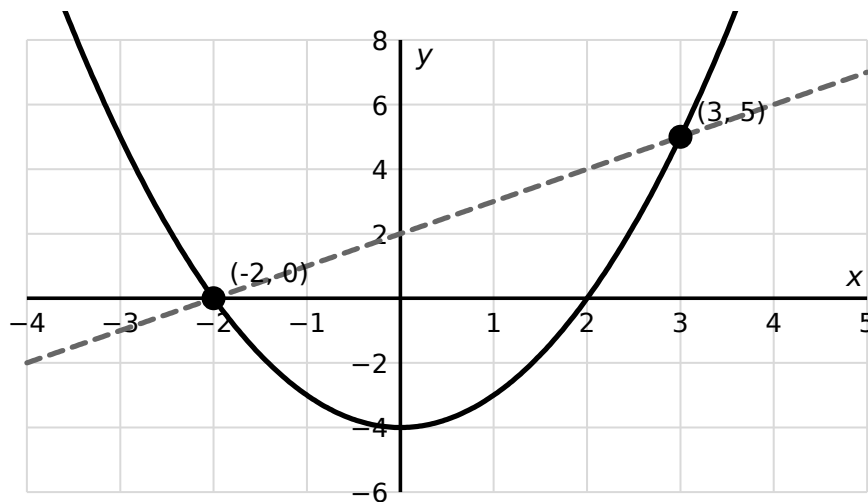
Scoring: 1 point each.

Question 5 Intersection of two graphs (3 points)

a. The graphs cross near $x = -2$ and $x = 3$.

b. $x^2 - 4 = x + 2$ gives $x^2 - x - 6 = 0$, so $(x - 3)(x + 2) = 0$. $x = 3$ or $x = -2$, at the points

$(3, 5)$ and $(-2, 0)$.



The intersections are $(-2, 0)$ and $(3, 5)$.

Scoring: 1 point for (a), 1 point for the equation, 1 point for both solutions.

Question 6 Scooter depreciation (3 points)

- a. $V(t) = 1800(0.85)^t$.
- b. $1800(0.85)^3 = 1800(0.614125) = \mathbf{\$1,105.43}$.
- c. $0.85^t = 0.5$, so $t = \ln 0.5 \div \ln 0.85 = 4.265$, or $\approx \mathbf{4.3 \text{ years}}$.

Scoring: 1 point per part.

Question 7 Ticket system (2 points)

$x + y = 120$ and $9x + 5y = 780$. Substitute: $9x + 600 - 5x = 780$, so $4x = 180$ and $x = 45$. **45 adult and 75 child tickets**. Check: $405 + 375 = 780$.

Scoring: 1 point for the equations, 1 point for the solution.

Question 8 Pen with a minimum area (2 points)

Length $20 - w$, so $w(20 - w) \geq 91$. Then $w^2 - 20w + 91 \leq 0$, so $(w - 7)(w - 13) \leq 0$. **$7 \leq w \leq 13$ feet.**

Scoring: 1 point for the inequality, 1 point for the interval.

Question 9 Check an identity (1 point)

Left: $(25 + 4)^2 = 841$. Right: $(25 - 4)^2 + (20)^2 = 441 + 400 = 841$. **Both sides equal 841.**

Scoring: 1 point for both sides.