

Exponential Models: Growth, Decay, and Interest

Grade 11 – Algebra 2 math · Test Answer Key · Standards: F-IF.C.8b, F-LE.A.4, F-LE.B.5

Each solution shows the formula, the substitution, and the rounded result. Allow answers that differ by a cent because of rounding at an intermediate step, and give partial credit for correct setup.

Standards: F-IF.C.8b, F-LE.A.4, F-LE.B.5 · **Level:** Grade 11 Algebra 2

Question 1 Reading a model (2 points)

a) Initial value **640**; factor 0.92, so a **decrease of 8%** per year.

b) $640(0.92)^4 \approx \mathbf{458.49}$.

Scoring: 1 point each part.

Question 2 Compound interest (3 points)

$n = 4$ and $nt = 36$: $A = 3,200(1 + 0.038/4)^{36} = 3,200(1.0095)^{36}$.

$A \approx \$4,497.57$

Scoring: 1 point for the formula, 1 point for substituting n , t , and r correctly, 1 point for the value.

Question 3 Continuous compounding (3 points)

a) $A = 5,000e^{0.04 \cdot 12} = 5,000e^{0.48} \approx \mathbf{\$8,080.37}$.

b) Annual: $5,000(1.04)^{12} \approx \$8,005.16$. The difference is $\$8,080.37 - \$8,005.16 \approx \mathbf{\$75.21}$.

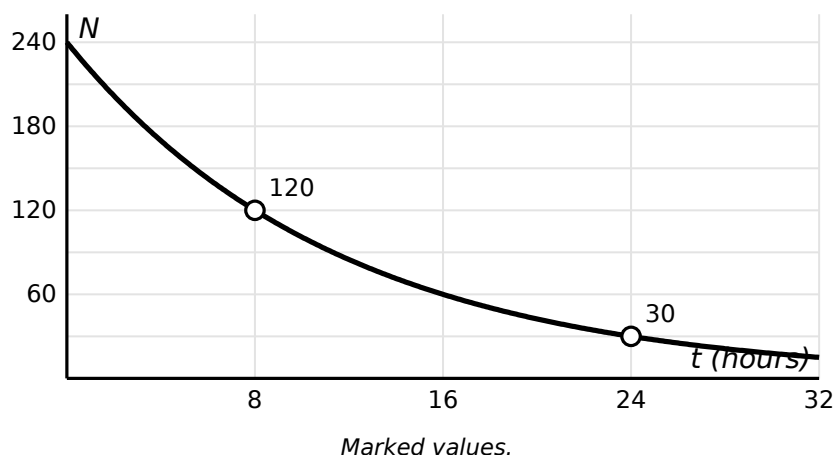
Scoring: 1 point for the formula, 1 for the value; 1 point for the difference.

Question 4 Half-life (3 points)

a) **$N(t) = 240(1/2)^{t/8}$** .

b) 24 hours is 3 half-lives: $240/8 = \mathbf{30 \text{ grams}}$.

c) $240(1/2)^{0.5} = 240/\sqrt{2} \approx \mathbf{169.7 \text{ grams.}}$



Scoring: 1 point per part.

Question 5 Doubling followers (3 points)

a) $F(t) = 1,800 \cdot 2^{t/4}$.

b) 12 days is 3 doublings: $1,800 \cdot 8 = \mathbf{14,400}$.

c) $1,800 \cdot 2^{0.5} \approx \mathbf{2,546}$.

Scoring: 1 point per part.

Question 6 Interpreting parameters (2 points)

28,000 is the initial value. The factor 0.85 means the value is multiplied by 0.85 each year, a decrease of 15% per year.

$V(2) = 28,000(0.7225) = \mathbf{\$20,230.00}$.

Scoring: 1 point for the meanings, 1 point for the value.

Question 7 Model from a table (2 points)

Ratios: $275/250 = 1.1$, $302.50/275 = 1.1$, $332.75/302.50 = 1.1$. The ratio is constant, so the growth is exponential.

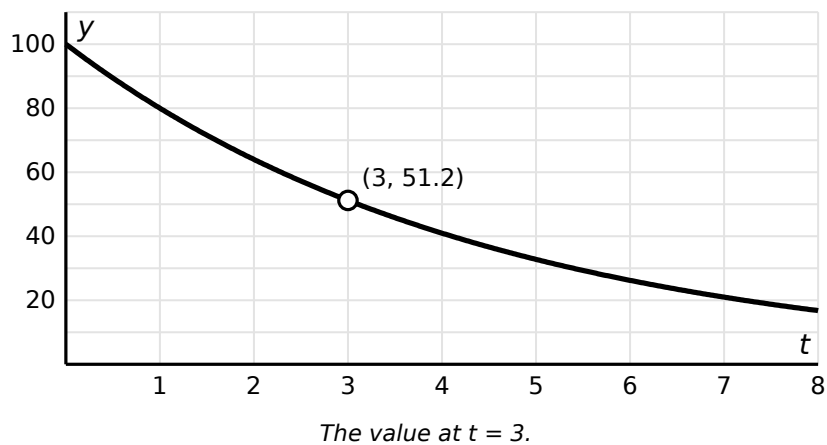
10% per year; $B(t) = 250(1.1)^t$

Scoring: 1 point for the constant ratio and percent, 1 point for the model.

Question 8 Decay from a graph (2 points)

a) $a = 100$ and $b = 80/100 = 0.8$: $y = \mathbf{100(0.8)^t}$. Check (2, 64): $100(0.64) = 64 \checkmark$.

b) $100(0.8)^3 = \mathbf{51.20}$.



Scoring: 1 point each part.