

Exponential Functions: math test solutions, Grade 11

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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 Classify and evaluate

/ 3 pts

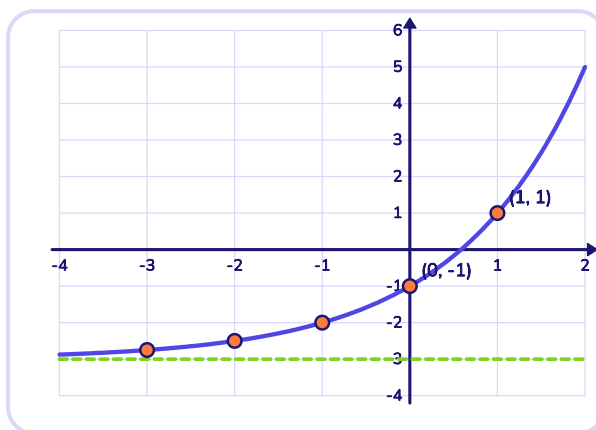
a. $b = 1.04 > 1$: growth of 4% (0.5 pt). $b = 0.95$: decay of 5% (0.5 pt).

b. $f(0) = 4$ (0.5 pt). $f(2) = 4 \cdot \frac{9}{4} = 9$ (0.75 pt). $f(-1) = 4 \cdot \frac{2}{3} = \frac{8}{3}$ (0.75 pt).

2 Transformations and graph

/ 4 pts

- a. Shift 1 unit left and 3 units down (1 pt).
- b. Asymptote $y = -3$ (0.5 pt); range $y > -3$ (0.5 pt).
- c. $g(0) = 2^1 - 3 = -1$, so $(0, -1)$ (1 pt).
- d. The values are $-2.75, -2.5, -2, -1, 1$ (0.5 pt); the curve is below.



The curve rises to the right and approaches the dashed asymptote on the left (0.5 pt).

3 Equation from two points

/ 3 pts

Divide the equations: $\frac{ab^3}{ab} = b^2 = \frac{108}{12} = 9$ (1 pt).

With $b > 0$, $b = 3$ (0.5 pt). Then $3a = 12$, so $a = 4$ (0.5 pt). Formula $f(x) = 4 \cdot 3^x$ (0.5 pt).

$$f(4) = 4 \cdot 81 = 324 \text{ (0.5 pt).}$$

4 Compound interest (calculator allowed)

/ 4 pts

(a) $A = 3500 \left(1 + \frac{0.032}{4}\right)^{20} = 3500(1.008)^{20} \approx 4104.67$ dollars (2 pts).

(b) $A = 3500 e^{0.032 \cdot 5} = 3500 e^{0.16} \approx 4107.29$ dollars (1 pt).

(c) Using the unrounded balances, **Math input error** dollars more (1 pt).

5 A laptop loses value

/ 3 pts

- (a) $V(t) = 1200(0.75)^t$ (1 pt).
- (b) $V(2) = 1200 \cdot 0.5625 = 675$ dollars (1 pt).
- (c) $V(3) = 1200 \cdot 0.421875 = 506.25 < 600$ while $V(2) = 675 > 600$: year 3 (1 pt).

6 Linking e and money

/ 3 pts

- (a) $1.01^{100} \approx 2.7048$ (0.5 pt), slightly under $e \approx 2.7183$, a gap of about 0.0135 (0.5 pt).
- (b) $A = 600e^{0.05 \cdot 8} = 600e^{0.4} \approx 600 \cdot 1.49182 \approx 895.09$ dollars (2 pts: 1 for the formula, 1 for the value).



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