

Exponential and Logarithmic Functions: math test solutions, Grade 12 – 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 Evaluating logarithms

/ 4 pts

- (a) $2^6 = 64$, so 6. (1 pt)
- (b) $5^{-3} = \frac{1}{125}$, so -3 . (1 pt)
- (c) $\ln e^{-2} = -2$. (1 pt)
- (d) $10^{\log 4.5} = 4.5$ by the inverse property. (1 pt)

2 Properties of logarithms

/ 3 pts

- (a) $\log_3 27 + 2 \log_3 x - \frac{1}{2} \log_3 y = 3 + 2 \log_3 x - \frac{1}{2} \log_3 y$. (2 pts)
- (b) $\ln \frac{3^2 \cdot 5}{15} = \ln \frac{45}{15} = \ln 3$. (1 pt)

3

Exponential equations (calculator allowed for part b)

/ 4 pts

- (a) $125 = 5^3$, so $x - 2 = 3$ and $x = 5$. (1 pt)
- (b) $4^x = 17 \Rightarrow x = \frac{\ln 17}{\ln 4} \approx 2.0437$. (1.5 pts)
- (c) Let $u = e^x$: $(u - 2)(u - 3) = 0$, so $e^x = 2$ or $e^x = 3$: $x = \ln 2 \approx 0.6931$ or $x = \ln 3 \approx 1.0986$. (1.5 pts)

4

Logarithmic equations

/ 3 pts

- (a) $2x - 5 = 9 \Rightarrow x = 7$; check $2(7) - 5 = 9 > 0$. (1 pt)
- (b) $x(x + 4) = 12 \Rightarrow x^2 + 4x - 12 = 0 \Rightarrow (x + 6)(x - 2) = 0$. (1 pt) Since $x > 0$, reject $x = -6$; answer $x = 2$. (1 pt)

5

Compound interest (calculator allowed)

/ 4 pts

- (a) $A = 6000(1.013)^{28} \approx \$8,614.22$. (1.5 pts)
- (b) $A = 6000e^{0.364} \approx \$8,634.45$. (1 pt)
- (c) $e^{0.052t} = 1.5 \Rightarrow t = \frac{\ln 1.5}{0.052} \approx 7.80$ years. (1.5 pts)

6

Radioactive decay (calculator allowed)

/ 2 pts

- (a) $N(30) = 640 \cdot 0.5^{30/12} = 640 \cdot 0.5^{2.5} \approx 113.14$ mg. (1 pt)
- (b) $40 = 640 \cdot 0.5^{t/12} \Rightarrow 0.5^{t/12} = \frac{1}{16} = 0.5^4 \Rightarrow t = 48$ days. (1 pt)



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