

Watch. Practice. Understand. | Lesson 219

Discovering the Truth Rigorous of Bacteria Growth or Decay and Logistic Growth Applicat...

Watch the matching video: <https://www.youtube.com/watch?v=u3E59Fxx8I0>

Practice focus: Exponential functions and models

Original extra practice matched to the listed lesson topic.

Name: _____ Date: _____ Show your reasoning and check units.

01 Solve $3^{(x + 1)} = 81$.

02 A population starts at 500 and doubles every 3 hours. Find its size after 9 hours.

03 An item worth \$800 loses 15% of its value per year. Find its value after 2 years.

04 Find the y-intercept, horizontal asymptote and range of $y = 2^x - 3$.

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Practice focus: Logistic growth

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Name: _____ Date: _____ Show your reasoning and check units.

05 For $P' = 0.2P(1 - P/1000)$, find equilibrium populations.

06 For that model, where is the positive growth rate largest?

07 Evaluate $P' = 0.2P(1 - P/1000)$ at $P = 200$.

08 For $P(t) = 1000/(1 + 9e^{(-0.2t)})$, find $P(0)$ and its long-run limit.

Worked answers | Lesson 219

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01 Solve $3^{(x+1)} = 81$.

$$81 = 3^4, \text{ so } x + 1 = 4 \text{ and } x = 3.$$

02 A population starts at 500 and doubles every 3 hours. Find its size after 9 hours.

$$P(t) = 500(2)^{(t/3)}. P(9) = 500(8) = 4000.$$

03 An item worth \$800 loses 15% of its value per year. Find its value after 2 years.

$$V = 800(0.85)^2 = \$578.$$

04 Find the y-intercept, horizontal asymptote and range of $y = 2^x - 3$.

At $x = 0$, $y = -2$. Asymptote $y = -3$; range $(-3, \text{infinity})$.

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Practice focus: Logistic growth

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05 For $P' = 0.2P(1 - P/1000)$, find equilibrium populations.

Set $P' = 0$: $P = 0$ and $P = 1000$.

06 For that model, where is the positive growth rate largest?

The rate is a concave-down quadratic in P , with vertex at $P = 500$.

07 Evaluate $P' = 0.2P(1 - P/1000)$ at $P = 200$.

$P' = 0.2(200)(0.8) = 32$ population units per unit time.

08 For $P(t) = 1000/(1 + 9e^{(-0.2t)})$, find $P(0)$ and its long-run limit.

$P(0) = 1000/10 = 100$. As $t \rightarrow \infty$, denominator tends to 1, so limit is 1000.