

Practice for Test on Exponential Functions

Name

Answers

1) Which of the exponential functions below show **growth** and which show **decay**?

a) $y = 100(1.7)^x$

Growth

b) $y = 10(1 + 0.12)^x$

Growth

c) $y = 8(0.4)^x$

Decay

2) The population of the city of Pearville, y , is decreasing according to the mathematical model $y = 160,500(.76)^x$, where x is the number of years. (Round all answers to the nearest whole number.)

a) What is the starting population of Pearville?

160,500

b) What would the population be in 10 years, if this trend continues?

$$y = 160,500 (.76)^{10} = 10286 \text{ people}$$

c) Use this model to predict about when the population of Pearville will be about 100 people.

$$100 = 160,500 (.76)^x \quad \boxed{\text{In about 27 years}}$$

Use guess & check or $y_1 = 160,500 (.76)^x$
+ look for 100 in y .

3) A population of 6000 bacteria is growing at a rate of 16% each day.

a) Write an equation that expresses the number of bacteria at time x .

$$y = 6000(1 + .16)^x \quad \text{or} \quad y = 6000(1.16)^x$$

b) About how many bacteria will there be in 10 days? (Round to nearest whole number.)

$$y = 6000(1.16)^{10} = 26468.61047$$

26,469
bacteria

4) Your new car cost \$32,000 but it depreciates in value by about 18% each year.

a) Write an equation that would indicate the value of the car at x years.

$$y = 32000(1 - .18)^x \quad \text{or} \quad y = 32000(.82)^x$$

b) How much will your car be worth in 5 years? (Round to the nearest cent.)

$$y = 32,000 (.82)^5 \\ = 11,863.67498$$

\$ 11,863.67

c) About how long will it take before your car is worth close to \$1000 dollars, according to your equation? Show your work and/or explain how you arrived at an answer.

$$1000 = 32,000 (.82)^x$$

Guess & check!

about 17 or 18 years

5) You invest \$200,000 in an account with 1.03% interest, compounded monthly. Assume you don't touch the money or add money other than the earned interest.

a) Write an equation that gives the amount of money, y, in the account after x years.

$$y = 200,000 \left(1 + \frac{.0103}{12} \right)^{12x}$$

b) How much money will you have in the account after 10 years?

$$y = 200,000 \left(1 + \frac{.0103}{12} \right)^{12(10)} \\ = 221,688.4876$$

\$ 221,688.49

6) You invest \$40,000 in an account with 3% interest, compounded quarterly. Assume you don't touch the money or add money other than the earned interest.

a) Write an equation that gives the amount of money, y , in the account after x years.

$$y = 40,000 \left(1 + \frac{.03}{4} \right)^{4x}$$

b) How much money will you have in the account after 6 years?

$$y = 40,000 \left(1 + \frac{.03}{4} \right)^{(4 \cdot 6)}$$

$$= 47,856.54118$$

\$ 47,856.54

7) Which would be a better deal? You invest \$2,000,000 in an account with 2% interest that compounds interest annually or you invest in an account with 1.99% interest compounded daily? Explain your answer and show work to support your answer.

Option 1

$$y = 2,000,000 (1 + .02)^1$$

$$y = 2,040,000$$

Try for 1 year + compare

Option 2

$$y = 2,000,000 \left(1 + \frac{.0199}{365} \right)^{365}$$

$$y = 2,040,197.54$$

When a bank compounds interest,

More \$

You earn interest on your interest!
So in option 2, even though the annual interest is lower, you end up making more \$ in interest.

8) Solve each exponential equation algebraically.

a) $7^{x+2} = 7^{3x-1}$

$$\begin{array}{ccc} x+2 & = & 3x-1 \\ -x+1 & -x+1 & \end{array}$$

$$\begin{array}{l} 3 = 2x \\ \frac{3}{2} = x \end{array}$$

c) $2^{3x+3} = 32^{x-1}$

$$2^{3x+3} = 2^{5x-5}$$

$$3x+3 = 5x-5$$

$$8 = 2x$$

$$x = 4$$

e) $\left(\frac{1}{8}\right)^x = 2^{2x-1}$

$$2^{-3x} = 2^{2x-1}$$

$$-3x = 2x-1$$

$$-5x = -1 \quad x = \frac{1}{5}$$

b) $3^{5x+2} = 9^x$

$$3^{5x+2} = 3^{2x}$$

$$5x+2 = 2x$$

$$2 = -3x$$

$$-\frac{2}{3} = x$$

d) $8^x = 4^{x+2}$

$$2^{3x} = 2^{2(x+2)}$$

$$3x = 2x+4$$

$$x = 4$$

f) $3^{x+7} = \left(\frac{1}{27}\right)^{2x}$

$$3^{x+7} = 3^{-3(2x)}$$

$$x+7 = -6x$$

$$7 = -7x$$

$$x = -1$$

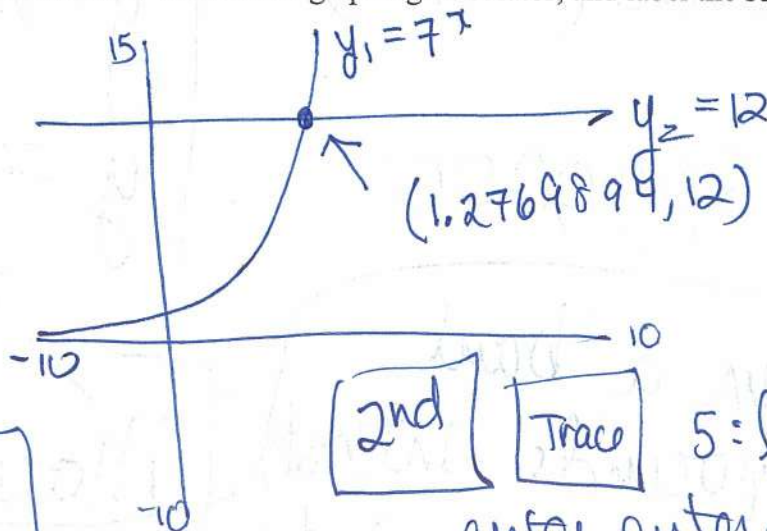
9) Solve the exponential equation below graphically. Round answer to the nearest tenth. To show work, make a sketch of the graph, indicate the window used on the graphing calculator, and label the solution.

$7^x = 12$

$$y_1 = 7^x$$

$$y_2 = 12$$

$$x = 1.3$$



2nd **Trace** 5: Intersect
enter, enter, enter