

9.2 Practice – Exponential Decay

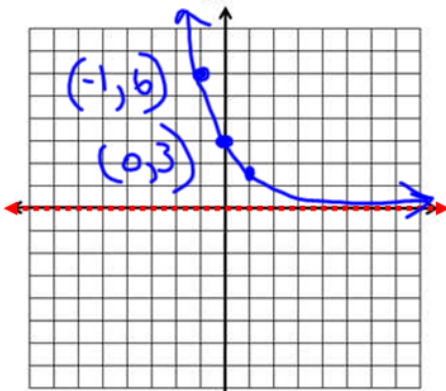
Name: Solutions

Tell whether the equation represents an exponential growth or an exponential decay function.

- | | | | |
|--|---|--|--|
| 1. $y = -2(3.2)^x$
growth | 2. $y = 5\left(\frac{1}{3}\right)^x$
decay | 3. $y = 6\left(\frac{5}{3}\right)^x$
growth | 4. $y = -3\left(\frac{1}{9}\right)^{-x}$
growth |
| 5. $y = 8(4)^{-x}$
decay | 6. $y = 3(0.2)^x$
decay | 7. $y = -\frac{1}{2}(6.3)^x$
growth | 8. $y = 12(0.8)^{-x}$
growth |
| 9. $y = 0.4\left(\frac{121}{120}\right)^{-x}$
decay | 10. $y = -4\left(\frac{5}{6}\right)^x$
decay | 11. $y = \frac{5}{6}\left(\frac{1}{3}\right)^{-x}$
growth | 12. $y = 2(10)^{-x}$
decay |

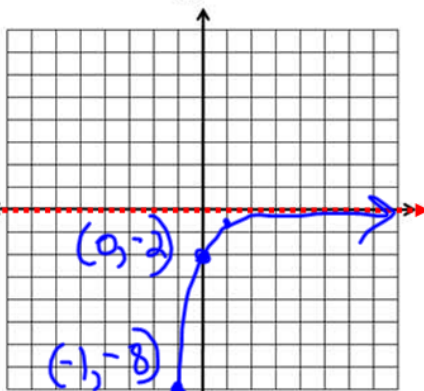
Sketch the graph of each exponential function by doing the following: Sketch the asymptote, label at least two distinct coordinate points on each graph, and write the domain and range of each function.

13. $y = 3\left(\frac{1}{2}\right)^x$



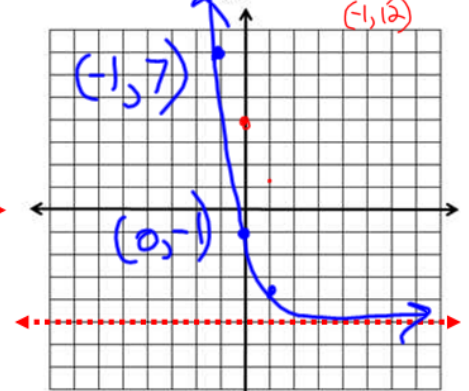
Domain: \mathbb{R} Range: $y > 0$

14. $y = -2\left(\frac{1}{4}\right)^x$



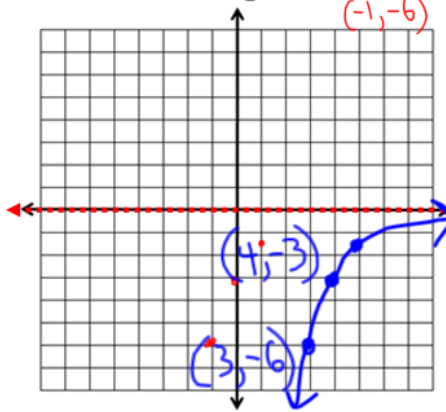
Domain: \mathbb{R} Range: $y < 0$

15. $y = 4\left(\frac{1}{3}\right)^x - 5$



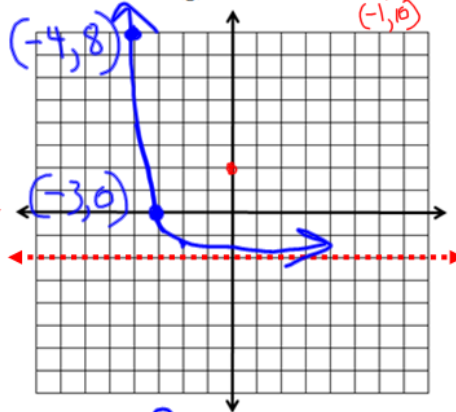
Domain: \mathbb{R} Range: $y > -5$

16. $y = -3\left(\frac{1}{2}\right)^{x-4}$



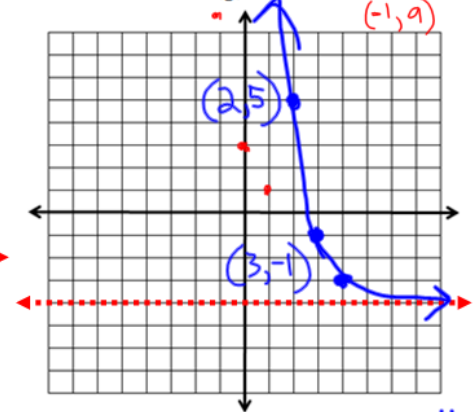
Domain: \mathbb{R} Range: $y < -3$

17. $y = 2\left(\frac{1}{5}\right)^{x+3} - 2$



Domain: \mathbb{R} Range: $y > -2$

18. $y = 3\left(\frac{1}{3}\right)^{x-3} - 4$



Domain: \mathbb{R} Range: $y > -4$

Give the percent increase or percent decrease for each equation.

19. $y = 50(2)^x$

$1+r=2$
 $r=1$

100% increase

24. $y = 10(0.855)^x$

$1-r=0.855$
 $r=0.145$

14.5% dec.

28. $y = 2(1.3)^x$

$1+r=1.3$
 $r=0.3$

30% inc.

21. $y = 1.25(0.95)^x$

$1-r=0.95$
 $r=0.05$

5% decrease

25. $y = 30(10)^x$

$1+r=10$
 $r=9$

900% inc.

29. $y = 1.5(0.45)^x$

$1-r=0.45$
 $r=0.55$

55% dec.

22. $y = 0.9(0.8)^x$

$1-r=0.8$
 $r=0.2$

20% dec.

26. $y = 0.5(1.23)^x$

$1+r=1.23$
 $r=0.23$

23% inc.

30. $y = 0.5(0.3)^x$

$1-r=0.3$
 $r=0.7$

70% dec.

23. $y = 3(3.4)^x$

$1+r=3.4$
 $r=2.4$

240% inc.

27. $y = 1.3(0.005)^x$

$1-r=0.005$
 $r=0.995$

99.5% dec.

31. $y = 1.3(4.075)^x$

$1+r=4.075$
 $r=3.075$

307.5% inc.

For each scenario, write an exponential model in function notation. Choose variables that would make sense for the problem. (There are no "correct" variables, but try to have them fit.)

32. A car that is worth \$25,000, decreases in value by 15% per year.

$V(t) = 25,000(0.85)^t$

33. Mr. Brust's IQ is currently 173, but it is decaying at a rate of 4.5% every year.

$I(t) = 173(0.955)^t$

34. A plague of mice has hit Australia again! Starting with only 30 mice, they can increase by 650% every month.

$M(t) = 30(7.5)^t$

35. There are 2,300 counts of bacteria in a Petri dish. Its total count increases by 168% per day.

$B(d) = 2300(2.68)^d$

36. During a Cleveland Brown's game, Sully's blood pressure rises 7.8% each quarter. At kickoff, his systolic blood pressure is 120.

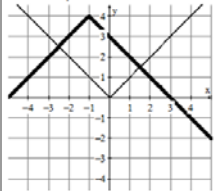
$P(q) = 120(1.078)^q$

37. Mr. Bean's yard is getting overrun with weeds. The first year he bought his home, there was 1800 square feet of grass. It is decreasing by 16.1% per year.

$G(t) = 1800(0.839)^t$

Algebra Skills:

1. Below are graphs of $f(x) = |x|$ (thin line) and its translation (bold line). Write an equation of the translation.



$f(x) = -|x+1|+4$

Simplify the fraction by rationalizing the denominator.

2. $\frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{2}$

3. $\frac{15}{4\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{5}}{4 \cdot 5}$

$\frac{3\sqrt{5}}{4}$

Solve by factoring.

4. $2x^3 - 4x^2 - 126x = 0$

$2x(x^2 - 2x - 63) = 0$
 $2x(x-9)(x+7) = 0$
 $x=0, 9, -7$

5. $30x^2 - 17x + 2 = 0$

$(30x-10)(3x+2) = 0$
 $\div 10 \quad \div 3$
 $(3x-2)(10x+1) = 0$
 $3x-2=0$ or $10x+1=0$
 $x=\frac{2}{3}$ or $x=-\frac{1}{10}$

SAT Prep:

1. Simplify: $(4^{3-x})^{2x}$

- (A) $(4)^{3+x}$
- (B) $(4)^{6x-2x^2}$
- (C) $(8)^{3x-x^2}$
- (D) $(16)^3$

$(3-x) \cdot 2x$
 $6x - 2x^2$

2. If $f(x) = 6(2)^{4-2x} + 2$, find $f(3)$.

$f(3) = 6(2)^{4-2(3)} + 2$
 $6(2)^{-2} + 2$
 $6 \cdot \frac{1}{4} + 2$
 $\frac{3}{2} + \frac{4}{2} = \frac{7}{2}$

