11-2 Exponential Functions

Key

7. The function $f(x) = 2500(0.5)^x$, where x is the time in years, models the number of gaming systems sold to students at a middle school. How many gaming systems will be sold in 4 years?

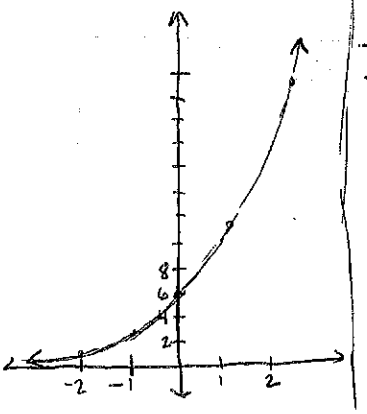
156 systems

$f(4) = 2500(0.5)^4$
$2500(0.0625)$
156.25

Graph each exponential function.

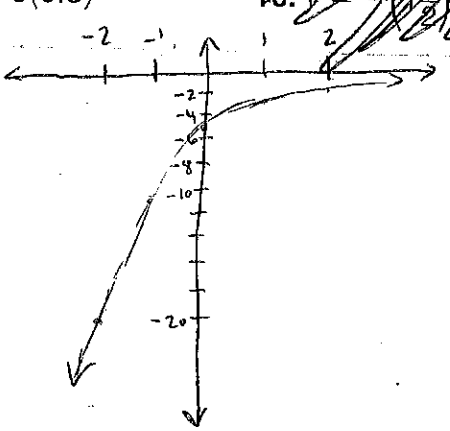
8. $y = 6(2)^x$

X	Y
-2	1.5
-1	3
0	6
1	12
2	24



9. $y = -5(0.5)^x$

X	Y
-2	-20
-1	-10
0	-5
1	-2.5
2	-1.25



10. ~~$y = -\frac{1}{2}(2)^x$~~

11-3 Exponential Growth and Decay

Compound Interest $A = P(1+\frac{r}{n})^{nt}$ Exp. Growth $y = a(1+r)^t$ Exp. Decay $y = a(1-r)^t$ Half-life $A = P(0.5)^t$

Write a function to model each situation. Then find the value of the function after the given amount of time.

11. Ed invested $5000 for college tuition and he expects to receive 5% interest annually; 5 years. $y = 5000(1+0.05)^5$ $y = \$6381.41$

12. A $1600 computer is losing value at a rate of 10% per year; 3 years.

$y = 1600(1-0.10)^3$ $y = \$1166.40$

13. $3500 is invested at a rate of 5.5% compounded quarterly; 4 years.

$A = 3500\left(1+\frac{0.055}{4}\right)^{4(4)} = 3500(1+0.01375)^{16} = 3500(1.014)^{16} = \$4371.95$

14. Francium-233 has a half-life of approximately 22 minutes. Find the amount of francium-233 left from an 88-gram sample after 54 minutes.

$\frac{54}{22} = 2.45$ $A = 88(0.5)^{2.45} =$ 16.10 grams

11-6 Radical Expressions

Simplify. All variables represent nonnegative numbers.

$-\sqrt{25}\sqrt{a^4}\sqrt{b^4}\sqrt{b^2}$

24. $\sqrt{108}$ $6\sqrt{3}$

$\sqrt{9}$ $\sqrt{12}$ $\sqrt{4}\sqrt{3}$

25. ~~$\sqrt{\frac{324}{4}}$~~

26. $-\sqrt{25a^4b^6}$ $-5a^2b^3$

$\frac{\sqrt{72}}{\sqrt{49}} = \frac{\sqrt{36}\sqrt{2}}{7} = \boxed{\frac{6\sqrt{2}}{7}}$

27. $\sqrt{\frac{72}{49}}$

28. $\sqrt{\frac{16a^6}{b^4}}$ $\frac{\sqrt{16}\sqrt{a^6}}{\sqrt{b^4}} = \boxed{\frac{4a^3}{b^2}}$

29. ~~$\sqrt{\frac{98a^4b^4}{486}}$~~

11-7 Adding and Subtracting Radical Expressions

Simplify each expression.

31. $2\sqrt{3} + 5\sqrt{3}$

$7\sqrt{3}$

~~32. $2\sqrt{7a} - 5\sqrt{63a}$~~

33. $5\sqrt{3} + 2\sqrt{75}$ $= 5\sqrt{3} + 10\sqrt{3}$

$\sqrt{25}\sqrt{3}$

5

$15\sqrt{3}$

~~34. $4\sqrt{5} + 3\sqrt{7}$~~

35. $5\sqrt{8} - 3\sqrt{18} + \sqrt{3}$

$5\sqrt{4}\sqrt{2} - 3\sqrt{9}\sqrt{2} + \sqrt{3}$

$5 \cdot 2\sqrt{2} - 3 \cdot 3\sqrt{2} + \sqrt{3}$

$10\sqrt{2} - 9\sqrt{2} + \sqrt{3}$

$\sqrt{2} + \sqrt{3}$

~~36. $2\sqrt{20x} - 3\sqrt{5x}$~~

Note

11-8 Multiplying and Dividing Radical Expressions

Multiply. Write each product in simplest form.

37. $\sqrt{3}\sqrt{5}$ $\sqrt{15}$

~~38. $2\sqrt{18}(3\sqrt{3})$~~

39. $2\sqrt{6}(3\sqrt{7})$ $6\sqrt{42}$

40. $(2\sqrt{5})^2$

$(2\sqrt{5})(2\sqrt{5})$

$4 \cdot 5 = 20$

~~41. $(6 - \sqrt{2})(6 + \sqrt{2})$~~

42. $(\sqrt{a} - 5)(3\sqrt{a} + 7)$

$3a + 7\sqrt{a} - 15\sqrt{a} - 35$

$3a - 8\sqrt{a} - 35$

Simplify each quotient.

43. $\frac{\sqrt{6}}{\sqrt{3}}$ $\frac{\sqrt{2}\sqrt{3}}{\sqrt{3}} = \sqrt{2}$

44. $\frac{\cancel{4}^{2}}{\cancel{2}\sqrt{3}} = \frac{2}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \boxed{\frac{2\sqrt{3}}{3}}$

45. $\frac{\sqrt{50}}{\sqrt{y^2}}$ $\frac{\sqrt{25}\sqrt{2}}{y} = \boxed{\frac{5\sqrt{2}}{y}}$

~~46. $\frac{6\sqrt{40}}{8\sqrt{2}}$~~

47. $\frac{-\cancel{12}^{4}\sqrt{24}}{\cancel{8}\sqrt{2}}$ $\sqrt{12}$

$-4\sqrt{12} = -4\sqrt{4}\sqrt{3}$

$-4 \cdot 2\sqrt{3} = -8\sqrt{3}$

~~48. $\frac{\sqrt{x}}{\sqrt{x} + \sqrt{y}}$~~

11-9 Solving Radical Equations

Solve each equation. Check your answer.

49. $(\sqrt{x})^2 = (5)^2$

$x = 25$

50. $\sqrt{2x} - 4 = 2$

$+4 \quad +4$

$(\sqrt{2x})^2 = (6)^2$ $2x = 36$

$x = 18$

51. $(\sqrt{x + 7})^2 = (10)^2$

$x + 7 = 100$

$-7 \quad -7$

$x = 93$

52. $\frac{\sqrt{x}}{4} = 5 \cdot 4$

$(\sqrt{x})^2 = (20)^2$

$x = 400$

~~53. $\sqrt{x + 5} - \sqrt{x} = 1$~~

~~54. $\sqrt{7 - x} + \sqrt{x + 11} = 6$~~