

Name \_\_\_\_\_

**Exponential Functions and Equations***Multiplication and Division Properties of Exponents***Simplify each expression.**

1.  $(-18m^2n)^2 \left(-\frac{1}{6}mn^2\right)$

2.  $(4g^3h)(-2g^5)$

3.  $(-xy)^3(xz)$

4.  $(-15xy^4)\left(-\frac{1}{3}xy^3\right)$

5.  $\left(\frac{q^{-1}r^3}{qr^3}\right)^{-5}$

6.  $\frac{m^{-2}n^{-5}}{(m^4n^3)^{-1}}$

7.  $\left(\frac{2x}{3}\right)^{-4}$

8.  $\left(\frac{x^{-3}y^5}{4^{-3}}\right)^0$

9.  $\frac{-12t^{-1}u^5x^{-4}}{2t^{-3}ux^5}$

*Radicals and Rational Exponents***Write the radical in exponential form/write exponent in radical form.**

10.  $\sqrt{17x}$

11.  $(7ab)^{\frac{1}{4}}$

12.  $13(ab)^{\frac{3}{2}}$

*Operations with Scientific Notation***Evaluate each product or quotient. Express the results in both scientific notation and standard form.**

13.  $(8.1 \times 10^{-6})(1.96 \times 10^{11})$

14.  $(7.2 \times 10^{-5})^2$

15.  $\frac{(4.2 \times 10^5)}{(3 \times 10^{-3})}$

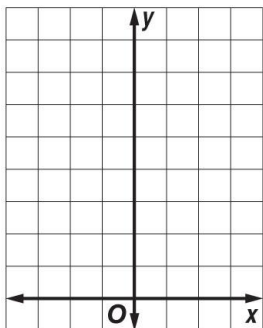
16.  $\frac{(1.76 \times 10^{-11})}{(2.2 \times 10^{-5})}$

17. Avogadro's number is an important concept in chemistry. It states that the number  $6.022 \times 10^{23}$  is approximately equal to the number of molecules in 12 grams of carbon 12. Use Avogadro's number to determine the number of molecules in  $5 \times 10^{-7}$  grams of carbon 12.

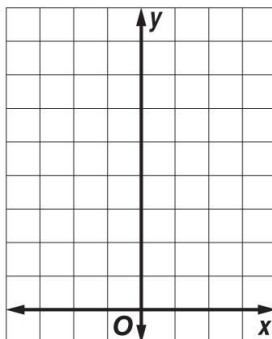
*Exponential Functions*

**Graph each function, find the y-intercept and state the domain and range using inequalities.**

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



19.  $y = 3(2^x)$

**Growth and Decay**

20. The Greens bought a condominium for \$110,000 in 2010. If its value appreciates at an average rate of 6% per year, what will the value be in 2015?  
34,400 km<sup>2</sup>,

21. During the 1990s, the forested area of Guatemala decreased at an average rate of 1.7%.

a. If the forested area in Guatemala in 1990 was about

write an equation for the forested area for  $t$  years after 1990.

b. If this trend continues, predict the forested area in 2015.

**Polynomial Expressions and Functions***Operations with Polynomials*

**Add, subtract or multiply.**

22.  $(x^3 - x + 1) - (3x - 1)$

23.  $3a(a^2 - 3a + 4) - 4(3a^3 - 2a^2)$

24.  $(2a - 3b)^2$

25.  $(2x + 11)(3x - 7)$

26.  $(3q + 2)(9q^2 - 12q + 4)$

27.  $\left(\frac{1}{4}x + 2\right)\left(\frac{1}{4}x - 2\right)$

**Factoring**

Factor each polynomial. If the polynomial cannot be factored using integers, write prime.

28.  $15g^3h^2 - 35g^2h + 40g$

29.  $75b^2c^3 + 60bc^6 - 35b^2c^4$

30.  $t^2 - 16t + 48$

31.  $2xy - x + 4y - 2$

32.  $6x^2 + x + 2$

33.  $49x^2 - 64y^2$

34.  $x^3 + 3x^2 - 4x - 12$

35.  $a^2 + 14a + 49$

36.  $8m^3 - 24m^2 + 18m$

Quadratic Functions

Solve each equation by factoring.

37.  $4x^2 - 3x = 0$

38.  $16x^2 = 81$

39.  $6d^2 + 21d = 10d + 35$

*Graphing Quadratics*

Find the following for each:

40.  $y = -2x^2 + 8x - 5$

41.  $y = 4x^2 - 4x + 1$

Vertex

\_\_\_\_\_

\_\_\_\_\_

Equation of the axis of symmetry

\_\_\_\_\_

\_\_\_\_\_

y-intercept of the graph

\_\_\_\_\_

\_\_\_\_\_

Max or Min?

\_\_\_\_\_

\_\_\_\_\_

Coordinate of max/min

\_\_\_\_\_

\_\_\_\_\_

Domain

\_\_\_\_\_

\_\_\_\_\_

Range

\_\_\_\_\_

\_\_\_\_\_

42. **BASEBALL** The equation  $h = -0.005x^2 + x + 3$  describes the path of a baseball hit into the outfield, where  $h$  is the height and  $x$  is the horizontal distance the ball travels.

a. What is the equation of the axis of symmetry?

b. What is the maximum height reached by the baseball?

c. An outfielder catches the ball three feet above the ground. How far has the ball traveled horizontally when the outfielder catches it?

*Solving by Graphing*

**Solve each quadratic by graphing in your calculator. If integral roots cannot be found, round to the nearest tenth.**

43.  $2m^2 + 5 = 10m$

44.  $2v^2 + 8v = -7$

*Transformations of Quadratics*

**Describe how each graph compares to the parent graph  $f(x) = x^2$**

45.  $g(x) = 2x^2 + 2$

46.  $g(x) = -\frac{3}{4}x^2 - \frac{1}{2}$

47.  $g(x) = -3(x + 4)^2$

*Quadratic Formula*

Write the quadratic formula here:

**State the value of the discriminant for each equation. Then determine the number of real solutions.**

48.  $x^2 + 8x + 16 = 0$

49.  $x^2 + 3x + 12 = 0$

**Solve each equation by using the Quadratic Formula. Round to the nearest hundredth if necessary.**

50.  $3x^2 - 1 = -8x$

51.  $4x^2 + 7x = 15$

52.  $1.6x^2 + 2x + 2.5 = 0$

*Completing the Square*

**Solve each equation by completing the square. Round to the nearest hundredth if necessary.**

53.  $x^2 + 12x + 21 = 10$

54.  $x^2 - 2x = 5$

55.  $x^2 - 14x + 30 = 6$

Comparing Linear and Nonlinear Functions

Look for a pattern in each table of values to determine which model (linear, quadratic or exponential) best describes the data. Then write an equation for the function that models the data.

56.

<b>x</b>	-3	-2	-1	0	1	2
<b>y</b>	32	16	8	4	2	1

57.

<b>x</b>	-3	-2	-1	0	1
<b>y</b>	-27	-12	-3	0	-3

For 58-60, decide whether the word problem represents a linear, or exponential function. Circle linear or exponential, then write the function formula.

58. A funny Vine video is sent to 100 people on day 1. Each person agrees to send the video to 5 people the next day, and to request that each of those people send it to 5 people the day after they receive it.

Linear or Exponential?

$f(x) = \underline{\hspace{4cm}}$

59. Ms. Hunter takes off 10 points each day a project is turned in late. The project is worth a total of 100 points.

Linear or Exponential?

$f(x) = \underline{\hspace{4cm}}$

60. The NCAA basketball tournament begins with 64 teams, and after each round, half the teams are eliminated.

Linear or Exponential?

$f(x) = \underline{\hspace{4cm}}$

*Growth and Decay*

61. The Greens bought a condominium for \$110,000 in 2010. If its value appreciates at an average rate of 6% per year, what will the value be in 2015?

62. During the 1990s, the forested area of Guatemala decreased at an average rate of 1.7%.

a. If the forested area in Guatemala in 1990 was about 34,400 km<sup>2</sup>, write an equation for the forested area for  $t$  years after 1990.

b. If this trend continues, predict the forested area in 2015.