Properties of Exponents

Simplify. Your answer should contain only positive exponents

1. $2m^2 \cdot 2m^3$

2. $m^4 \cdot 2m^3$

3. $4r^{-3} \cdot 2r^2$

4. $4n^4 \cdot 2n^{-3}$

5. $2k^4 \cdot 4k$

6. $2x^3 y^{-3} \cdot 2x^{-1} y^3$

7. $2y^2 \cdot 3x$

8. $4x^3 \cdot xy^2$

9. $4a^3 b^2 \cdot 3a^{-4} b^{-3}$

10. $x^2 y^{-4} \cdot x^3 y^2$

11. $(x^2)^0$

12. $(2x^2)^{-4}$

13. $(4r^0)^4$

14. $(4a^3)^2$

15. $(3k^4)^4$

16. $(4xy)^{-1}$

17. $(2b^4)^{-1}$

18. $(x^2y^{-1})^2$

19. $(2x^4y^3)^{-1}$

20. $(3m)^{-2}$

21. $\dfrac{r^2}{2r^3}$

22. $\dfrac{x^{-1}}{4x^4}$

23. $\dfrac{3n^4}{3n^3}$

24. $\dfrac{m^4}{2m^4}$

25. $\dfrac{3m^{-4}}{m^3}$

26. $\dfrac{2x^4y^{-4}z^{-3}}{3x^2y^{-3}z^4}$

27. $\dfrac{4x^0y^{-2}z^3}{4x}$

28. $\dfrac{2h^3j^{-3}k^4}{3jk}$
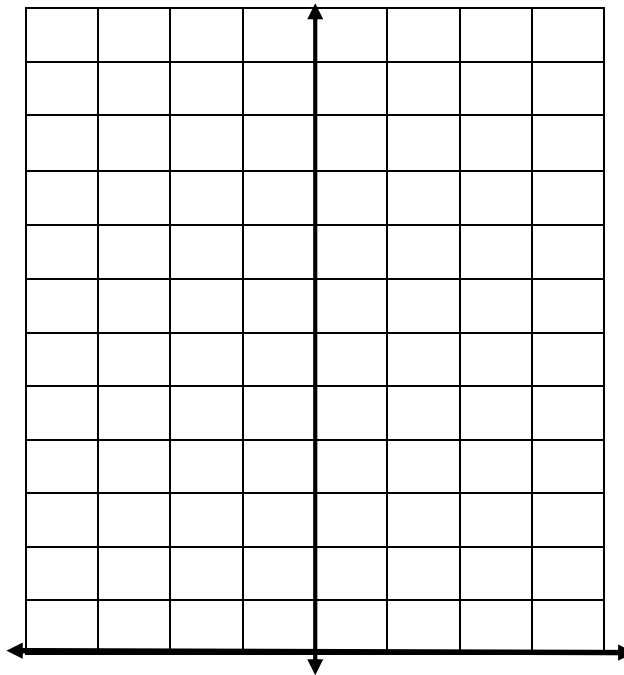
29. $\dfrac{4m^4n^3p^3}{3m^2n^2p^4}$

30. $\dfrac{3x^2y^{-1}z^{-1}}{x^{-4}y^0z^0}$

Graphing Exponential Functions
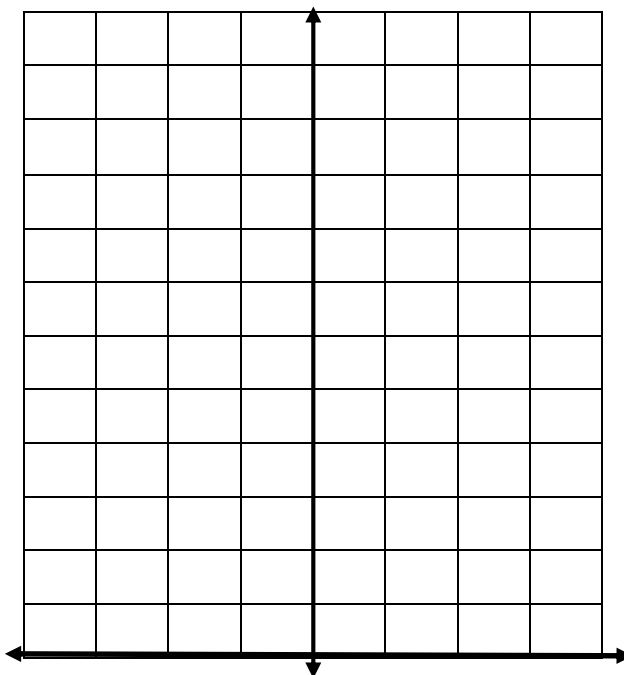
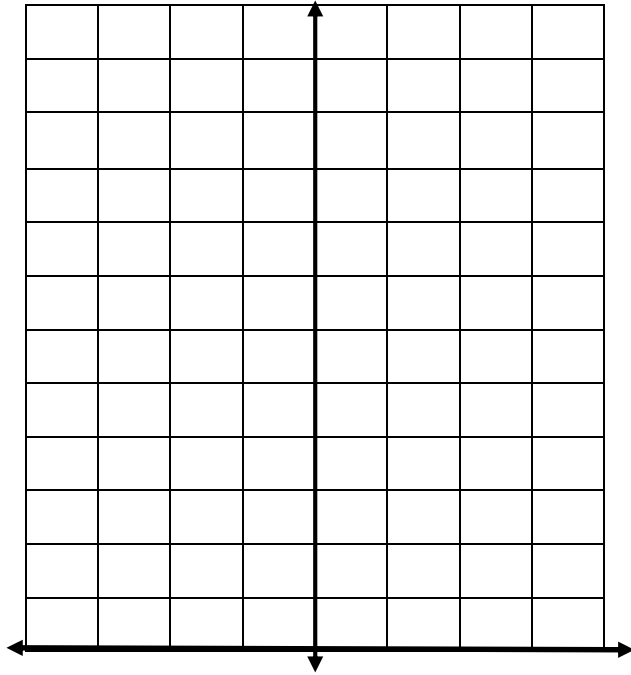**Sketch the graph of each function.**

1. $y = 4 \cdot 2^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	

2. $y = 5 \cdot 2^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	

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

x	y
-3	
-2	
-1	
0	
1	
2	
3	

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

x	y
-3	
-2	
-1	
0	
1	
2	
3	
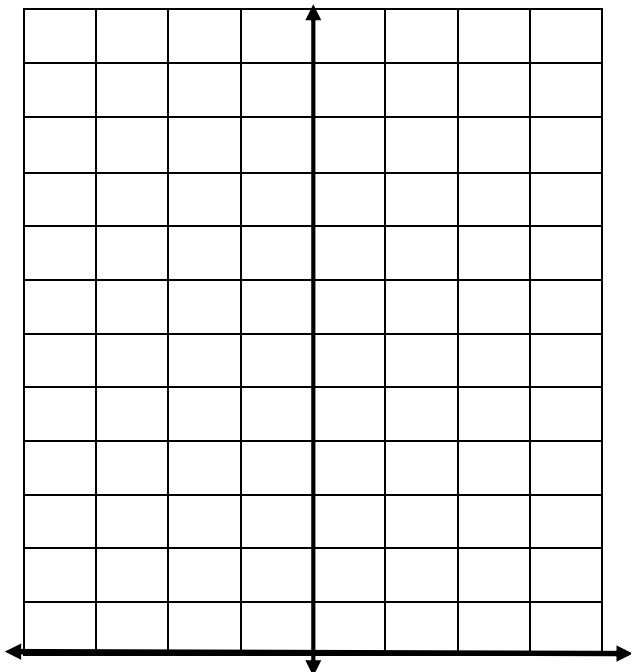
5. $y = 3 \cdot 2^{x-2} + 2$

x	y
-3	
-2	
-1	
0	
1	
2	
3	
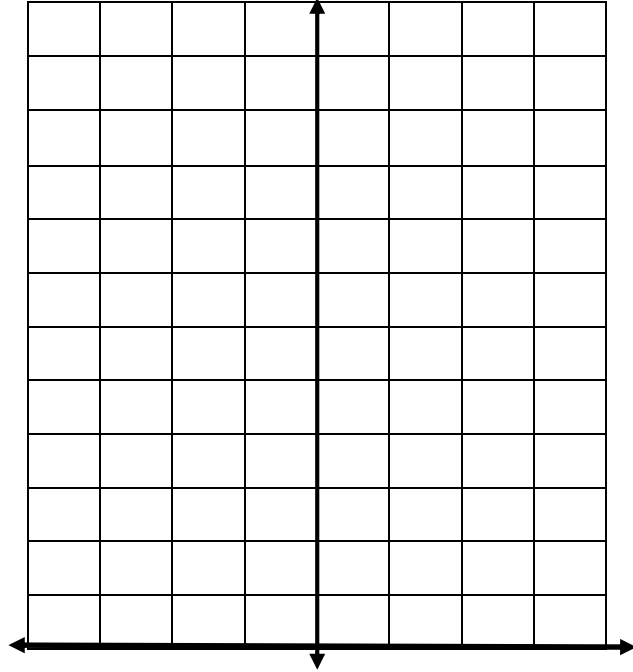
6. $y = 4 \cdot \left(\frac{1}{2}\right)^{x-1}$

x	y
-3	
-2	
-1	
0	
1	
2	
3	
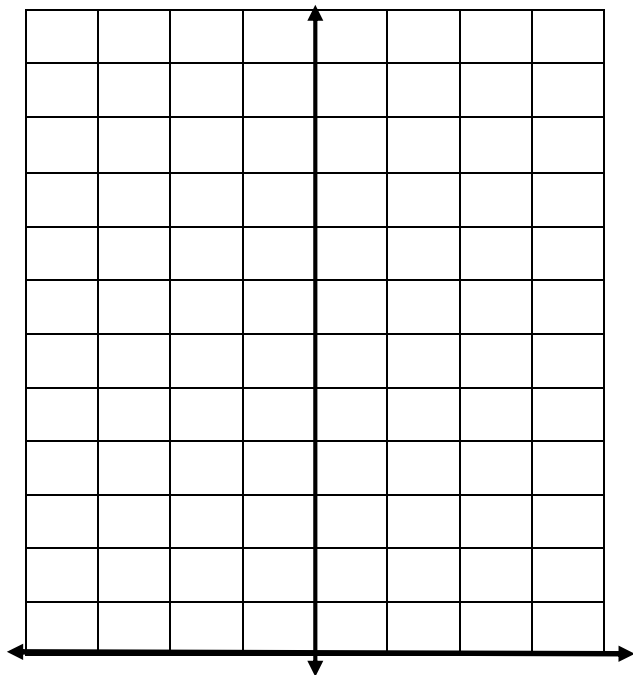
7. $y = 3^{x-2}$

x	y
-3	
-2	
-1	
0	
1	
2	
3	
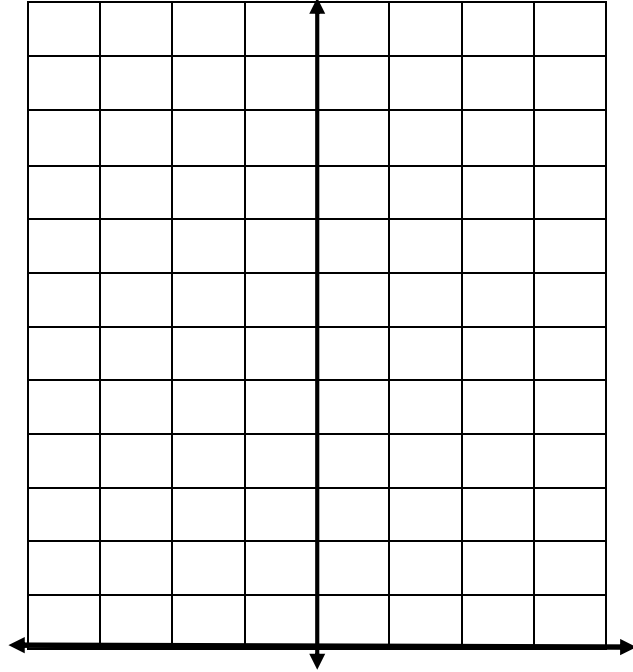
8. $y = 2^x + 1$

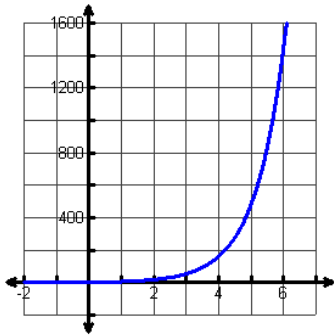| x	y
-3	
-2	
-1	
0	
1	
2	
3	
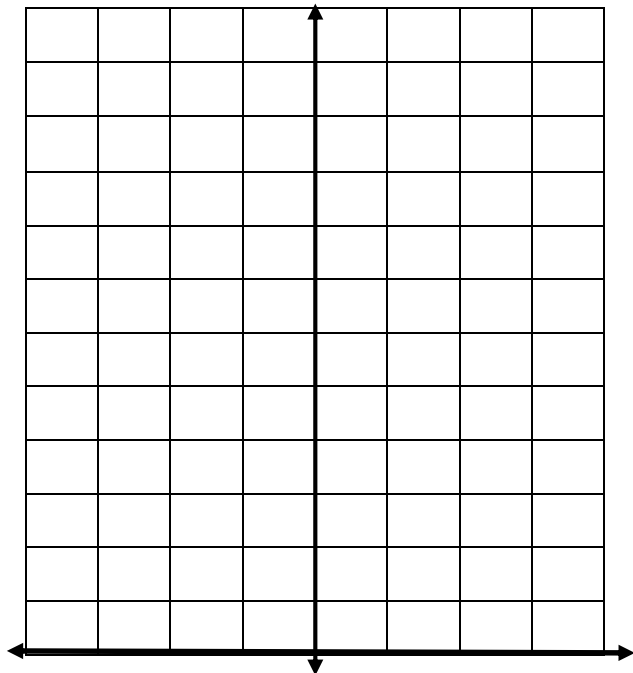
Characteristics of Exponential Functions

Identify the key characteristics of the following functions.

1.

Domain: _____

Range: _____

Asymptote: _____

x-intercept: _____

y-intercept: _____

Growth or Decay

2.

Domain: _____

Range: _____

Asymptote: _____

x-intercept: _____

y-intercept: _____

Growth or Decay

3.

Domain: _____

Range: _____

Asymptote: _____

x-intercept: _____

y-intercept: _____

Growth or Decay

4.

Domain: _____

Range: _____

Asymptote: _____

x-intercept: _____

y-intercept: _____

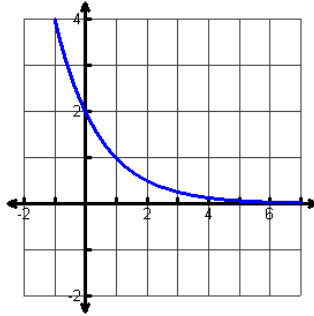Growth or Decay

5.

Domain: _____

Range: _____
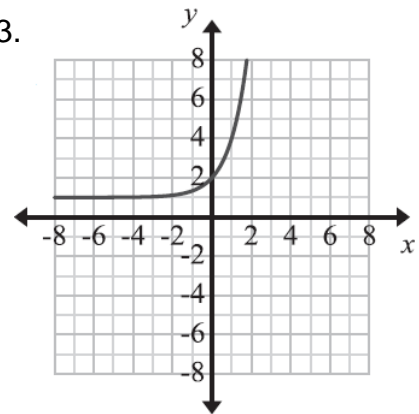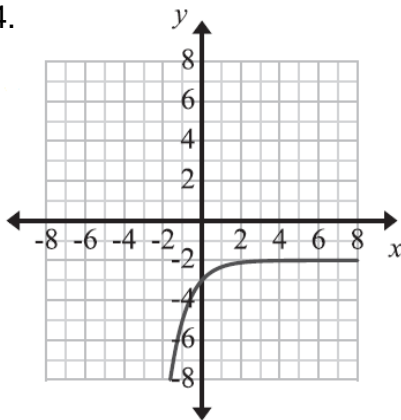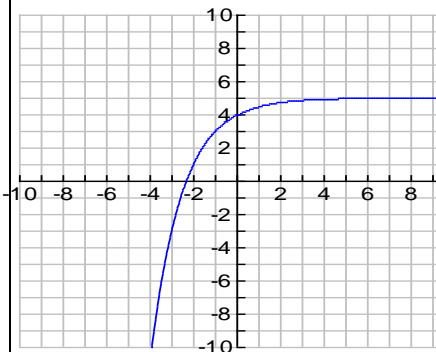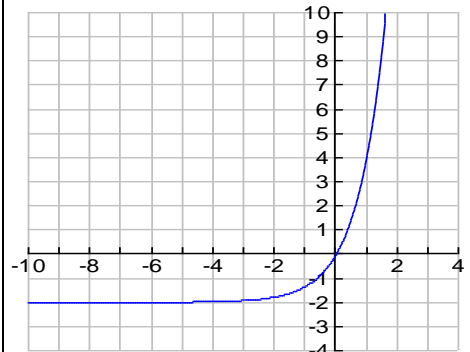
Asymptote: _____

x-intercept: _____

y-intercept: _____

Growth or Decay

6.

Domain: _____

Range: _____

Asymptote: _____

x-intercept: _____

y-intercept: _____

Growth or Decay

Compound interest
Use the compound interest formula to find the ending balance.

1. A = _____
    P = $600.00
    r = 4%,
    n = 1
    t = 10

2. A = _____
    P = $1200.00
    r = 4%,
    n = 1
    t = 5

3. A = $1403.60
    P = _____
    r = 6.8%,
    n = 12
    t = 5

4. A = $563.35
    P = _____
    r = 1.2%,
    n = 1
    t = 10

5. $34,000 at 4% for 3 years annually

6. $210 at 8% for 7 years annually

7. $4,000 at 3% for 4 years semi annually

8. $20,600 at 8% for 2 years quarterly

9. $14,000 at 6% for 9 years daily

10. $2,300 at 7% for 9 years weekly

11. $43,800 at 4.8 % for 2 years weekly

12. $35,800 at 8.2% for 3 years semi annually

13. $7,400 at 10.5% for $\frac{1}{4}$ years daily

14. $1,900 at 5.9% for $2\frac{3}{4}$ years annually

Exponential Growth and Decay Word Problems

1. Find a bank account balance if the account starts with $100, has an annual rate of 4%, and the money left in the account for 12 years.

2. In 1985, there were 285 cell phone subscribers in the small town of Centerville. The number of subscribers increased by 75% per year after 1985.How many cell phone subscribers were in Centerville in 1994?

3. Bacteria can multiply at an alarming rate when each bacteria splits into two new cells, thus doubling. If we start with only one bacteria which can double every hour, how many bacteria will we have by the end of one day?

4. Each year the local country club sponsors a tennis tournament. Play starts with 128 participants. During each round, half of the players are eliminated. How many players remain after 5 rounds?

5. The population of Winnemucca, Nevada, can be modeled by $P=6191(1.04)t$ where t is the number of years since 1990. What was the population in 1990? By what percent did the population increase by each year?

6. You have inherited land that was purchased for $30,000 in 1960. The value of the land increased by approximately 5% per year. What is the approximate value of the land in the year 2011?

7. During normal breathing, about 12% of the air in the lungs is replaced after one breath. Write an exponential decay model for the amount of the original air left in the lungs if the initial amount of air in the lungs is 500 mL. How much of the original air is present after 240 breaths?

8. An adult takes 400 mg of ibuprofen. Each hour, the amount of ibuprofen in the person's system decreases by about 29%. How much ibuprofen is left after 6 hours?

9. You deposit $1600 in a bank account. Find the balance after 3 years for each of the following situations:

   a. The account pays 2.5% annual interest compounded monthly.

   b. The account pays 1.75% annual interest compounded quarterly.

   c. The account pays 4% annual interest compounded yearly.

10. You buy a new computer for $2100. The computer decreases by 50% annually. When will the computer have a value of $600?

11. You drink a beverage with 120 mg of caffeine. Each hour, the caffeine in your system decreases by about 12%. How long until you have 10mg of caffeine?

12. The foundation of your house has about 1,200 termites. The termites grow at a rate of about 2.4% per day. How long until the number of termites doubles?

13. Bank A is offering a 2.7%, compounded annually, savings account guaranteed for three years. Bank B is offering a 1.9%, compounded monthly, savings account guaranteed for two years. Which bank would yield the most on a principal of $500.00? What is the dollar amount difference between the two bank accounts?

14. How much would need to be deposited into an account earning 4.7%, compounded quarterly, so that the balance will be $1,000,000.00 in 20 years?

15. Mary discovers a bank account her parents left for her that was opened when she was born 50 years ago. The statement she found states the deposit amount of $100.00 into an account earning 1.8% compounded quarterly. What is the balance of her account now?

16. In the same box, Mary discovers another statement for an account her grandparents opened for her when she was born. This statement shows a deposit amount of $100.00 into a 3.6%, compounded quarterly, account. How much is in this account now?

17. Luckily, Mary finds a third statement for an account her Aunt opened for her. This was also $100.00 at 1.8%, but it is compounded monthly. How much is in this account now? Based on the answers for each of the accounts Mary discovered, is it better to compound more often or earn a higher interest rate?

18. An account earning 6.6% interest compounded continuously for 10 years would have a balance of how much if the principal was $550.00?

19. What was the principal for a continuously compounded account earning 3.9% for 15 years that now has a balance of $2,500,000.00?

20. A teenager saved small dollar amounts throughout the school year and now has $712.00. They can choose from two bank offers. The first is 5.3% compounded continuously for six years. The second is compounded quarterly for five years at 6.0%. Which account will yield the most money? What is the dollar amount difference between the accounts at the end of their terms?