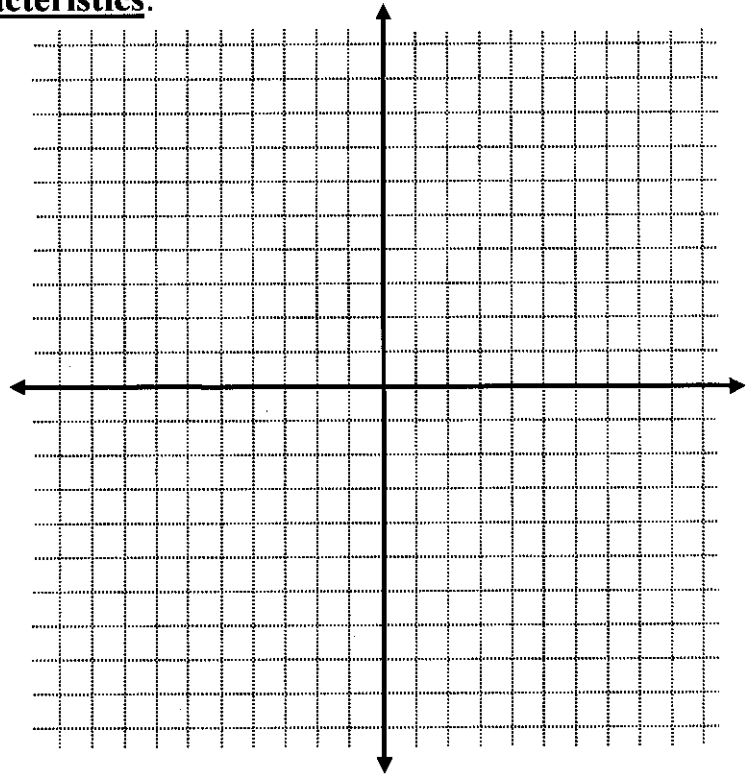


Graph the functions and **list all characteristics**:

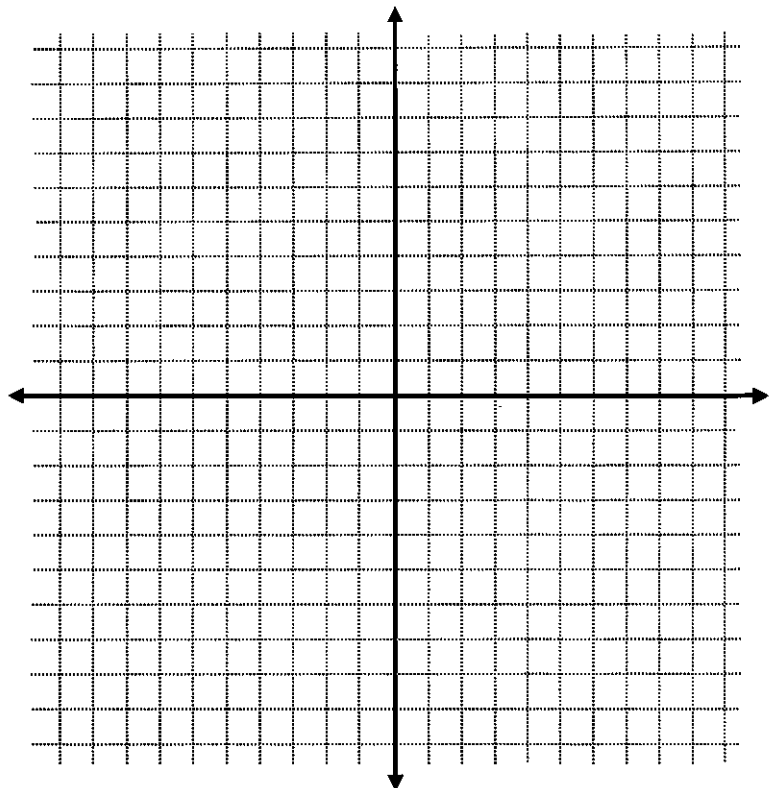
1. $f(x) = 4^x - 1$

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



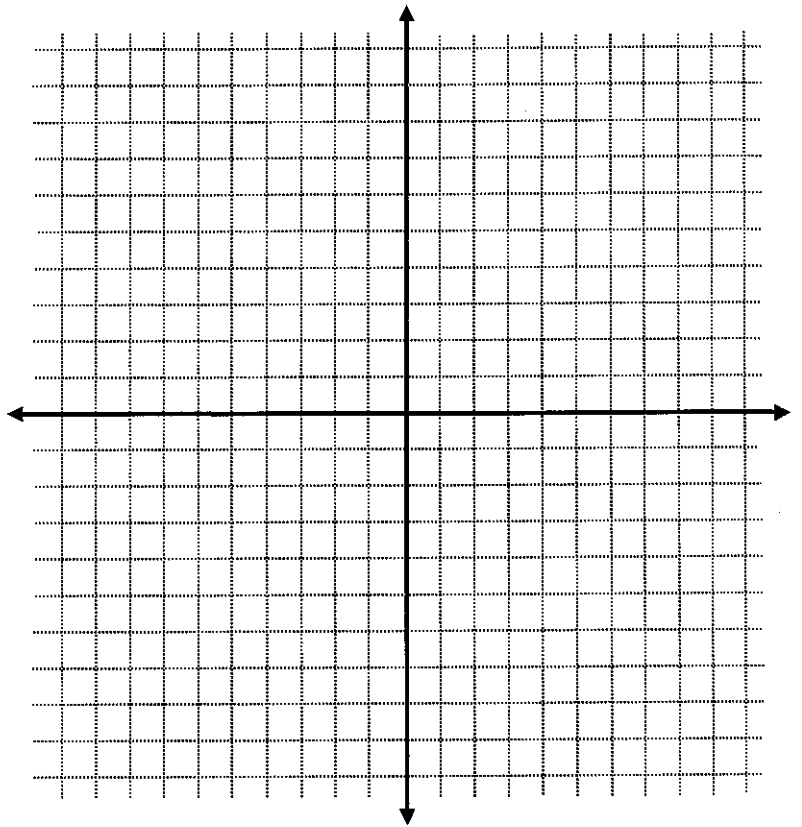
2. $f(x) = 0.5^x$

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



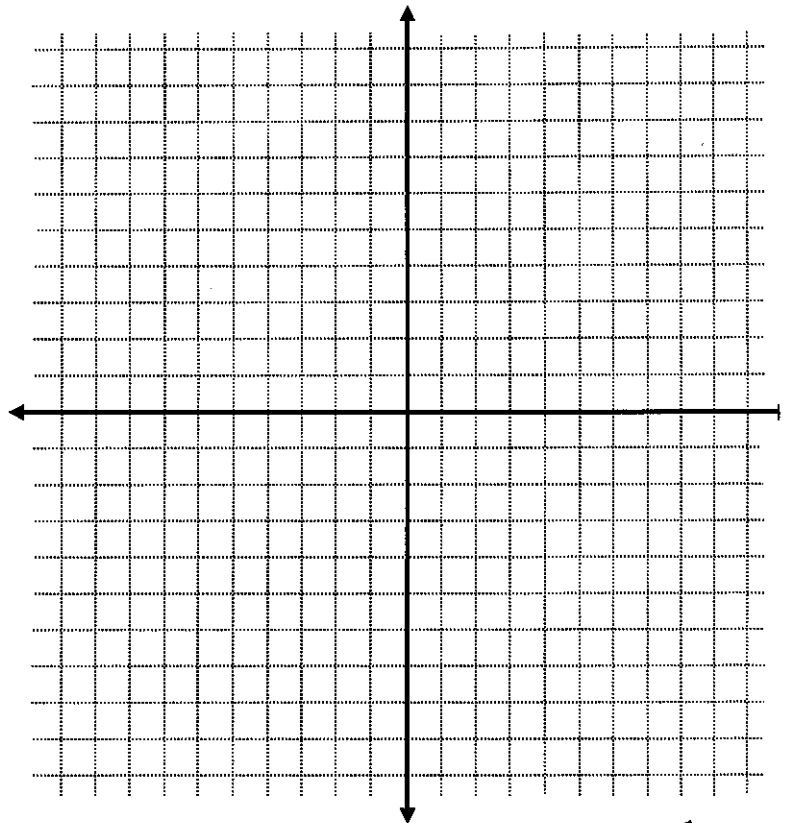
3. $f(x) = 2\left(\frac{1}{2}\right)^x$

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



4. $f(x) = 2^{-x} + 2$

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



Properties of Exponents and Solving Exponential Equations (with Like Bases) WS

There are 5 basic properties of exponents

1. $a^n a^m = a^{n+m}$

2. $(a^n)^m = a^{n \cdot m}$

3. $a^0 = 1$

4. $\frac{a^n}{a^m} = a^{n-m}$

5. $a^{-n} = \frac{1}{a^n}$

Use these properties to simplify the following problems.

1. $(x^3 y^4)(x^2 y^5)$

6. $\frac{x^{2y}}{x^y}$

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

7. $\frac{3x^3 y^8}{81x^4 y^5}$

3. $(x^6 y^2 z^{15})^0$

8. $(2^x)(2^x)$

4. $(x^7)^y$

9. $2^x + 2^x$

5. $(x^{2y})(x^{3y})$

10. $\frac{3^x + 3^x}{3^x}$

answers: 1) $x^5 y^9$ 2) $x^6 y^3$ 3) 1 4) x^{7y} 5) x^{5y} 6) x^y 7) $\frac{y^3}{27x}$ 8) 2^{2x} or 4^x 9) $2(2^x)$ 10) 2

The properties of exponents can be used to solve exponential equations. The first step is to rewrite the equation so that the bases on both sides of the equation are the same. If the bases on both sides are the same, then the exponents must be equal. For instance,

$$3^{x+1} = 9^x$$

both bases can be made the same...

$$3^{x+1} = (3^2)^x$$

using the exponent properties...

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

if the bases are the same, then the exponents must be equal, so...

$$x+1 = 2x$$

and $x = 1$

Try these problems:

1. $2^x = 8$

6. $8^{7x} = 16^{3x+9}$

2. $3^{x+5} = 9^2$

7. $7^{3x+5} = 7^{x-3}$

3. $5^{2x+3} = \frac{1}{125}$

8. $\left(\frac{1}{7}\right)^x = 7^{x+4}$

4. $\left(\frac{1}{2}\right)^{x+4} = 8^{x-1}$

9. $10^{3x+5} = 10^{x-3}$

5. $\left(\frac{1}{9}\right)^{x-2} = 81^{5-x}$

10. $27^{7x} = 81^{3x+9}$

Think about these:

11. If $2^x = 8$ yields $x = 3$ and $2^x = 16$ yields $x = 4$, what would $2^x = 10$ yield?

12. How would you solve $5^x = 37$?

answers: 1) 3 2) -1 3) -3 4) -1/4 5) 8 6) 4 7) -4 8) -2 9) -4 10) 4

10.4 Practice - Exponential Functions

Solve each equation.

1) $3^{1-2n} = 3^{1-3n}$

2) $4^{2x} = \frac{1}{16}$

3) $4^{2a} = 1$

4) $16^{-3p} = 64^{-3p}$

5) $\left(\frac{1}{25}\right)^{-k} = 125^{-2k-2}$

6) $625^{-n-2} = \frac{1}{125}$

7) $6^{2m+1} = \frac{1}{36}$

8) $6^{2r-3} = 6^{r-3}$

9) $6^{-3x} = 36$

10) $5^{2n} = 5^{-n}$

11) $64^b = 2^5$

12) $216^{-3v} = 36^{3v}$

13) $\left(\frac{1}{4}\right)^x = 16$

14) $27^{-2n-1} = 9$

15) $4^{3a} = 4^3$

16) $4^{-3v} = 64$

17) $36^{3x} = 216^{2x+1}$

18) $64^{x+2} = 16$

19) $9^{2n+3} = 243$

20) $16^{2k} = \frac{1}{64}$

21) $3^{3x-2} = 3^{3x+1}$

22) $243^p = 27^{-3p}$

23) $3^{-2x} = 3^3$

24) $4^{2n} = 4^{2-3n}$

25) $5^{m+2} = 5^{-m}$

26) $625^{2x} = 25$

27) $\left(\frac{1}{36}\right)^{b-1} = 216$

28) $216^{2n} = 36$

29) $6^{2-2x} = 6^2$

30) $\left(\frac{1}{4}\right)^{3v-2} = 64^{1-v}$

31) $4 \cdot 2^{-3n-1} = \frac{1}{4}$

32) $\frac{216}{6^{-2a}} = 6^{3a}$

33) $4^{3k-3} \cdot 4^{2-2k} = 16^{-k}$

34) $32^{2p-2} \cdot 8^p = \left(\frac{1}{2}\right)^{2p}$

35) $9^{-2x} \cdot \left(\frac{1}{243}\right)^{3x} = 243^{-x}$

36) $3^{2m} \cdot 3^{3m} = 1$

37) $64^{n-2} \cdot 16^{n+2} = \left(\frac{1}{4}\right)^{3n-1}$

38) $3^{2-x} \cdot 3^{3m} = 1$

39) $5^{-3n-3} \cdot 5^{2n} = 1$

40) $4^{3r} \cdot 4^{-3r} = \frac{1}{64}$



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ALGEBRA 2

WORKSHEET SOLVING EXPONENTIAL EQUATIONS

Solve each equation for x.

1) $2^x = 2^{3x-4}$

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

3) $25^{x+3} = 25^{5x-7}$

4) $4^{3x-5} = 4^{8-x}$

5) $5^{x+1} = 25$

6) $3^{x-5} = 27$

7) $2^{3x-4} = 8^{x-1}$

8) $3^{2x-4} = 1$

9) $4^{x+2} = 8$

10) $9^x = 27$

11) $\left(\frac{1}{3}\right)^{x+2} = 9^{3x}$

12) $\left(\frac{1}{4}\right)^{x-1} = 32^{x+3}$

13) $18^{4x} = 18^x$

14) $125^{3-2x} = 5^{x-1}$

15) $4^{x-1} = \frac{1}{64}$

16) $\left(\frac{1}{4}\right)^x = 8^{x-1}$

17) $3^x = 3\sqrt{3}$

18) $5^x = 25\sqrt{5}$

19) $4^{2x} = 16\sqrt[3]{4}$

20) $3^{x-4} = 9\sqrt{3}$

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