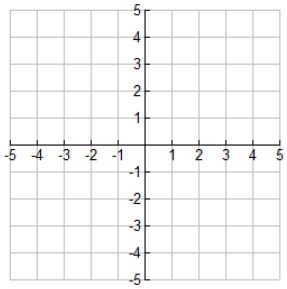
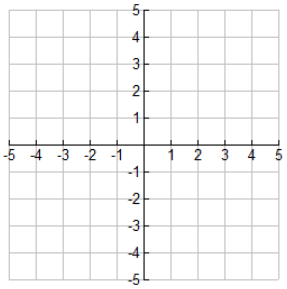
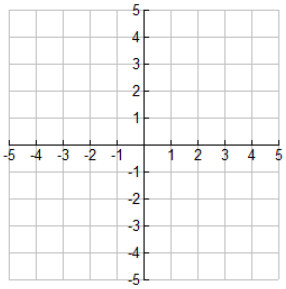
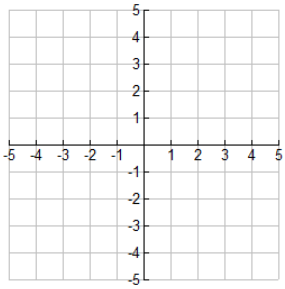
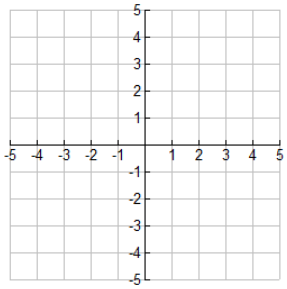
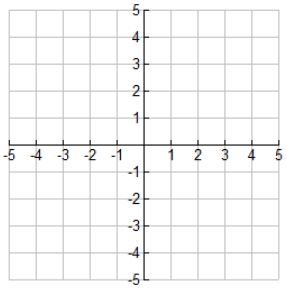
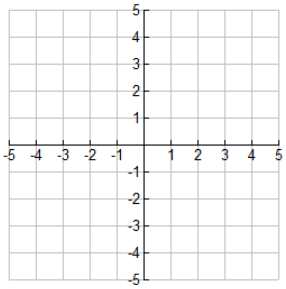
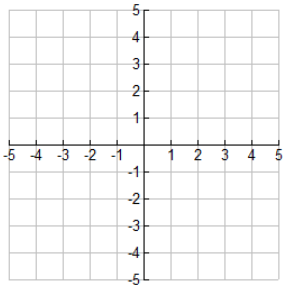
4.5 – Power Functions and Equations

Power Functions and Their Characteristics

– **power function** → a function in the form _____ (k and p are constants) where k is called the constant of proportionality and p is the exponent (p can be any real value, rational/irrational, or positive/negative)

Below are some examples of power functions where k = 1 and various values for p:

Power Function # 1	Power Function # 2	Power Function # 3	Power Function # 4
$y = x^0$ 	$y = x^1$ 	$y = x^2$ (or x^4, x^6, …) 	$y = x^3$ (or x^5, x^7, …) 
Power Function # 5	**Power Function # 6**	**Power Function # 7**	**Power Function # 8**
$y = x^{-1}$ or $y = 1/x$ 	$y = x^{-2}$ or $y = 1/x^2$ 	$y = x^{½}$ or $y = \sqrt{x}$ 	$y = x^{⅓}$ or $y = \sqrt[3]{x}$ 

Example 1: Determine which are power functions, circle YES or NO. If YES, state value of k and p.

a.) $f(x) = 5\sqrt[3]{x^{12}}$ power function? Circle one: YES NO where k = ____ and p = _____

b.) $f(x) = 6(x-1)^2$ power function? Circle one: YES NO where k = ____ and p = _____

c.) $f(x) = \sqrt{\frac{36}{x^5}}$ power function? Circle one: YES NO where k = ____ and p = _____

d.) $10y + 2 = 5x^4 + 2$ power function? Circle one: YES NO where k = ____ and p = _____

e.) $f(x) = -5 \cdot 2^x$ power function? Circle one: YES NO where k = ____ and p = _____

f.) ¼ $y = (x-3)(x+3) + 9$ power function? Circle one: YES NO where k = ____ and p = _____

g.) $y + 3 = 3(x+1)$ power function? Circle one: YES NO where k = ____ and p = _____

Example 2: Find the equation of a power function with the given information.

Power Function in the form $y = k \cdot x^p$ where the point (x , y) and the point (1 , ?) (k = ?) are on the graph		
a.) pts (2 , 12) ; (1 , 4)	b.) pts (7 , 9) ; (1 , ½)	c.) pts (4 , 0.375) and (9 , 0.25)

Solving Power Equations – Direct and Inverse Variations

Direct Variation Equation: _____ (where p is a positive #)	**Inverse Variation Equation:** _____ (where p is a negative #)

Example 3: Complete each variation problem.

a.) Suppose y is directly proportional to x. If y = 18 when x = 8, find the constant of proportionality (k). After finding the formula for y, then use it to find x when y = 27.	b.) Suppose c is inversely proportional to the square of d. If c = 4 when d = 2, find the constant of proportionality (k). After finding the formula for c, then use it to find c when d = – 8.
c.) The radius of a sphere is directly proportional to the cube root of its volume. If a sphere of radius 18.2 cm has a volume of 25,252.4 cm^3, what is the volume of a sphere if the radius is 19.3 cm?	