### Variation

#### Direct Variation

**y** varies directly as **x** if there is some nonzero constant **k** such that:

\[ y = kx \]

- **k** is the constant of variation
- **x** is the variable

#### Inverse Variation

**y** varies inversely as **x** if there is some nonzero constant **k** such that:

\[ y = \frac{k}{x} \quad x \neq 0 \]

#### Joint Variation

**y** varies jointly as **x** & **z** if there is some nonzero constant **k** such that:

\[ y = kxz \quad x \& z \neq 0 \]
1. If $y$ varies directly as $x$ & $y = 6$ when $x = 11$, find $y$ when $x = 3$.

Find $k$:

$$y = kx$$

$$\frac{6}{11} = k(11)$$

$$k = \frac{6}{11}$$

$$y = \frac{6}{11}(3)$$

$$y = \frac{18}{11}$$

2. If $y$ varies inversely as $x$ & $y=10$ when $x=20$, find $x$ when $y=16$.

Find $k$:

$$y = \frac{k}{x}$$

$$\frac{10}{20} = \frac{k}{x}$$

$$x = \frac{200}{16}$$

$$x = 12.5$$

3. The volume of a cone varies jointly as the square of the radius of the base, $r^2$, & the height, $h$. Find the eq. of joint variation if $V=285$, $r=4$, $h=17$.

Find $k$:

$$V = kx^2h$$

$$285 = k(4)^2(17)$$

$$285 = 272k$$

$$k = \frac{285}{272}$$

$$V = 1.05\cdot r^2h$$
The circumference of a circle is proportional to the radius with a constant of $2\pi$.

$$C = 2\pi r$$

Boyle's law states that the volume of an enclosed gas (at a constant temperature) varies inversely as the applied pressure.

$$V = \frac{T}{P}$$
2.2 Power Functions

Power Function \[ y = k \cdot x^n \]

when \( k \) & \( n \) are non-zero constants

\( k \) - constant of variation

\( n \) - power - when \( n \) is negative then it's an inverse variation Why??
Which of the following are power functions?? If they are a power function - what is the constant of variation, is it direct or inverse variation?

\[ y = 5 \cdot x^2 \]  
\[ y = 7^x \]

\[ y = \frac{3}{4} \cdot x^{\frac{5}{2}} \]
Monomial Function

\[ y = k \cdot x^n \]

\[ y = k \]

n is positive

Which of the following are monomial functions?? If they are- what is the degree and the coefficient?

\[ y = -5 \cdot x^{-3} \]

\[ y = -6 \cdot x \]

\[ y = \frac{3}{4} \cdot x \]
\[ y = k \cdot x^{\text{even}} \]

\[ y = k \cdot x^{-\text{even}} \]
\[ y = k \cdot x^{\text{odd}} \]

\[ y = k \cdot x^{-\text{odd}} \]
\[
y = k \cdot x^{\text{even}}
\]

\[
y = k \cdot x^{-\left(\frac{\#}{\text{even}}\right)}
\]
\[ y = k \cdot x^{\frac{\#}{odd}} \]

\[ y = k \cdot x^{-\left(\frac{\#}{odd}\right)} \]