

Advanced Algebra 2: CH variation and other common functions  
DIRECT and INVERSE VARIATION FUNCTION INTRODUCTION

**Direct Variation:** (k is the constant of proportionality)

y varies directly with x.  $y = kx$

Note that this is a linear function through the origin.

y varies directly with the square of x.  $y = kx^2$

Note that this is a quadratic function through the origin.

y varies directly with the cube of x.  $y = kx^3$

Note that this is a cubic function through the origin.

y varies directly with x the nth power.  $y = kx^n$

Note that this is a nth degree polynomial through the origin.

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**Example 1:** Suppose y varies directly with x and  $y = 25$  when  $x = 10$ . Write the function of this relationship and determine the value of y when  $x = 16$ .

**Solution:**  $y = kx$  and with substitution:  $25 = k(10)$  which implies  $k = \frac{25}{10} = \frac{5}{2}$

So the function is  $y = \frac{5}{2}x$  and  $y = \frac{5}{2}(16) = 20$  when  $x = 16$ .

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**Example 2:** Suppose y varies directly with the cube of x and  $y = 100$  when  $x = 4$ . Write the function of this relationship and determine the value of y when  $x = 10$ .

**Solution:**  $y = kx^3$  and with substitution:  $100 = k(4)^3 \Rightarrow 100 = k(64)$  which implies

$$k = \frac{100}{64} = \frac{25}{16}$$

So the function is  $y = \frac{25}{16}x^3$  and  $y = \frac{25}{16}(10)^3 = \frac{25}{16}(1000) = \frac{3125}{2}$  when  $x = 10$ .

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Complete problems 1 and 5 from section 7.11