Square Roots Absolute Value Inequalities	Distance Formula Midpoint Formula
$\begin{vmatrix} \nabla x^0 =  x^2  \\ \sqrt{2c} \end{vmatrix} = \begin{vmatrix}  x  < c \\ -c < x < c \end{vmatrix}$	$\begin{vmatrix} A(x_1, y_2) \text{ and } B(x_2, y_2) \\ B) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \end{vmatrix} \begin{vmatrix} A(x_1, y_2) \text{ and } B(x_2, y_2) \\ \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) \end{vmatrix}$
Equation of a Circle $(x-h)^2+(y-k)^2=r^2$ Point-Slope Form $y-y_1=m(x-x_1)$ Standard $Ax+By+c$	
$ \begin{array}{c c} \text{Joint} & \text{Perpendicular} \\ \text{Variation} & \text{Lines} \\ \text{jointly as } x \text{ and } y, \\ z = kxy & m_2 = -\frac{1}{m_1} \end{array}                                   $	of Change $= \frac{f(x_2) - f(x_1)}{x_2 - x_1} \begin{bmatrix} \text{Difference of Cubes} \\ a^3 + b^3 = (a+b)(a^2 - ab + b^2) \\ a^3 - b^3 = (a-b)(a^2 + ab + b^2) \end{bmatrix} \begin{bmatrix} \text{Standard Form of a} \\ \text{Quadratic Function} \\ f(x) = a(x-h)^2 + k \end{bmatrix}$
Graph $y = f(x) + c$ by shifting $y = f(x)$ up $c$ .	Horizonal Shifts of Graphs popose $c > 0$ .  aph $y = f(x - c)$ by shifting $y = f(x)$ right $c$ .  The popose $c > 0$ aph $y = f(x + c)$ by shifting $y = f(x)$ left $c$ .  Definition of Log if $a^x = y$ , log <sub>a</sub> $y = x$ Length $s = r\theta$
Reflecting Graphs Graph $y = -f(x)$ by reflecting $y = f(x)$ in the x-axis. Graph $y = f(-x)$ by reflecting $y = f(x)$ in the y-axis.	
Horizontal Stretching of Graphs To graph $y = f(cx)$ , graph $y = f(x)$ , then if $c > 1$ shrink horizontally by a factor of $\frac{1}{c}$ if $0 < c < 1$ stretch horizontally by a factor of $\frac{1}{c}$	Even and Odd Functions if $f(-x) = f(x)$ if $f(x)$ is even if $f(-x) = -f(x)$ if $f(x)$ is odd  Heron's Formula $A = \sqrt{s(s-a)(s-b)(s-c)}$
Min or Max of a Quadratic Function Base $f(x) = x(x-h)^2 + k  f(h) = k$ $f(x) = ax^2 + bx + c  f(-\frac{b}{2a})$	Completing the Square With a quadratic in form $ax^2 + bx = c$ $\left(\frac{1}{2} \cdot b\right)^2 = c$ Hidden quadratic 1 $x^{-3/2} + 2x^{-1/2} + x^{1/2}$ quadratic 2 $e^{2x} + 2e^x + 1$ $e^{x-3/2}(1+x)^2$
Permutations $p(x,y) = \frac{x!}{(x-y)!}$ $Choose Formula$ $C(x,y) = \begin{pmatrix} x \\ y \end{pmatrix} = \frac{x!}{y!(x-y)!}$	Law of Sines $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ Degrees to Radians $\frac{A \cdot \pi}{180} = \theta$ Remainder Theorem If $P(x) \div (x - c)$ , the remainder $P(c)$ .
$\sin = \frac{\text{opp}}{\text{hyp}}  \cos = \frac{\text{adj}}{\text{hyp}}  \tan = \frac{\text{opp}}{\text{adj}}$ $A = \frac{1}{2}r^2\theta$	Direct Variation If y is directly proportional to x, $y = kx$ Population Growth n is population size, r is relative growth rate, t is time $n = n_0 e^{rt}$ Area of $\Delta$ $A = ab \cdot \frac{1}{2} \sin C$

1

Property of logs  $(\log_a b)(\log_c d) = (\log_a d)(\log_c b)$ 

## Algebra of Functions

Let f and g be functions with domains A and B.

$$(f+g)(x) = f(x) + g(x)$$
 Domain  $A \cap B$   
 $(f-g)(x) = f(x) - g(x)$  Domain  $A \cap B$ 

$$(f-g)(x) = f(x) - g(x)$$

Domain  $A \cap B$ 

$$(f-g)(x) = f(x) - g(x)$$
$$(fg)(x) = f(x)g(x)$$

Domain  $A \cap B$ 

Domain 
$$\{x \in A \cap B \mid g(x) \neq 0\}$$

$$(f \circ q)(x) = f(q(x))$$

Domain  $\{x \in B \mid g(x) \in A\}$ 

## Polynomial Synthetic Division

$$\begin{array}{c|cccc}
(x^3 + x^2 - 1) \div (x + 2) \\
-2 & 1 & 1 & 0 & -1 \\
& & -2 & 2 & -4
\end{array}$$

Polynomial Long Division 
$$x^2 - x + 2$$

Rational Roots Theorem  $2x^3 + 2x^2 - 3x - 6$  $\pm 1, \pm 2$  $\pm 1, \pm 2, \pm 3, \pm 6$ Possible rational roots:

 $\pm 1, \pm \frac{1}{2}, \pm 2, \pm 3, \pm \frac{3}{2}, \pm 6$ 

=2

Decartes' Rule of Signs Count num. of sign changes  $P(x) = 3x^6 + 4x^5 + 3x^3 - x - 3$ 1 positive real root. 1 positive real root  $P(-x) = 3x^6 - 4x^5 - 3x^3 + x - 3$ 1 or 3 negative real roots

Logarithm Formulas  $\log(m \cdot n) = \log m + \log n$  $\log\left(\frac{m}{n}\right) = \log m - \log n$ 

$$\log(m^n) = n \cdot \log m$$

 $\log_b b^x = x = b^{\log_b x}$ 

Other trig stuff  $\cot =$ 

Horizontal Asymptotes

$$y = \frac{2x^2 - 4x + 5}{x^2 - 2x + 1}$$
 Original Equation  
$$= \frac{2x^2}{x^2}$$
  $x \to \infty$ , other terms  $\to$  tiny

Cancel, horizontal asymptote

Slant Asymptotes

$$y = \frac{x^2 - 4x - 5}{x - 3}$$
 Original Equation
$$= x - 1 - \frac{8}{x - 3}$$
 Divide

= x - 1

 $x \to \infty$ , other terms  $\to \text{tiny}$ 

Vertical Asymptotes

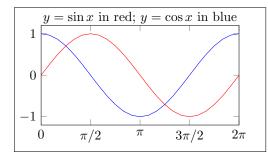
$$y = \frac{2x^2 - 4x + 5}{x^2 - 2x + 1}$$
 Original Equation  

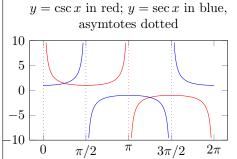
$$= \frac{2x^2 - 4 + 5}{(2x - 1)(x + 2)}$$
 Factor demoniator  

$$x = \frac{1}{2} \text{ or } x = -2$$
 Impossible

End Behavior  $n \text{ is odd } \subset$ 

Trig Identities  $\sin^2 + \cos^2 = 1$  $\tan^2 + 1 = \sec^2$  $1 + \cot^2 = \csc^2$ 





sin/cos/csc/sec Graph Properties

If in form:

 $y = a\sin k(x - b)$ amplitude |a|, period  $2\pi/k$ , phase shift b