

Properties of Square Roots

$$\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$$

$$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

$$(\sqrt{a})^m = \sqrt{a^m}$$

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

$$\sqrt{a^m} = (\sqrt{a})^m$$

$$\sqrt[n]{a} = n\sqrt[n]{a^k}$$

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}$$

$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$$

$$(\sqrt[n]{a})^m = \sqrt[n]{a^m}$$

$$\sqrt[n]{m}\sqrt[n]{a} = m\sqrt[n]{a}$$

Laws of Exponents and Logarithms

Exponent Rules	Logarithm Rules
$a^m \cdot a^n = a^{m+n}$	$\log(mn) = \log m + \log n$
$\frac{a^m}{a^n} = a^{m-n}$	$\log\left(\frac{m}{n}\right) = \log m - \log n$
$(a^m)^n = a^{mn}$	$\log m^n = n \log m$

Change of Base Formula

$$\log_b a = \frac{\log_c a}{\log_c b}$$

$$\log_b a = \frac{\log_c a}{\log_c b}$$

(OR)

$$\log_b a \cdot \log_c b = \log_c a$$

Find an equation of a line that:

passes through two points

$$y = mx + b$$

that is parallel to one another

isolate b

that is perpendicular to one another

solve for x

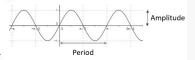
Graphing Trigonometric Functions

$$y = A \sin[B(x - C)] + D$$

|A| is the amplitude
The period is $\frac{2\pi}{B}$

Phase (horizontal) shift is C
Vertical shift is D

The same applies for the Cosine Function.
For the Tangent Function, the period is $\frac{\pi}{B}$



Formulas

$$\text{Distance Formula}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\text{Midpoint Formula}$$

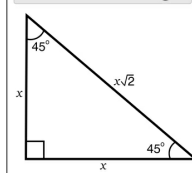
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Side Ratios

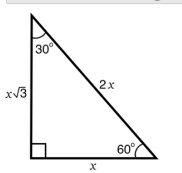
Special Right Triangles

MATH MONKS

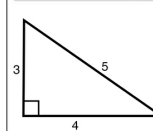
45-45-90 Triangle



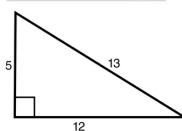
30-60-90 Triangle



3-4-5 Triangle



5-12-13 Triangle



Trigonometric Functions

Functions	Domain	Range
(i) sine	R	[-1, 1]
(ii) cosine	R	[-1, 1]
(iii) tangent	$R - \{x : x = (2n + 1)\frac{\pi}{2}, n \in Z\}$	R
(iv) cosecant	$R - \{x : x = n\pi, n \in Z\}$	$R - [-1, 1]$
(v) secant	$R - \{x : x = (2n + 1)\frac{\pi}{2}, n \in Z\}$	$R - [-1, 1]$
(vi) cotangent	$R - \{x : x = n\pi, n \in Z\}$	R

Trig

Function	Domain	Range
$\sin^{-1}(x)$	$[-\frac{\pi}{2}, \frac{\pi}{2}]$	$[-\frac{\pi}{2}, \frac{\pi}{2}]$
$\cos^{-1}(x)$	$[0, \pi]$	$[0, \pi]$
$\tan^{-1}(x)$	R	$(-\frac{\pi}{2}, \frac{\pi}{2})$
$\csc^{-1}(x)$	$R - \{0\}$	$(-\frac{\pi}{2}, \frac{\pi}{2}) - \{0\}$
$\sec^{-1}(x)$	$R - \{-1, 1\}$	$[0, \pi] - \{\frac{\pi}{2}\}$
$\cot^{-1}(x)$	R	$(0, \pi)$

Rational Root Theorem

Possible Rational Roots:

$$f(x) = 2x^3 - 3x^2 - 11x + 6$$

$a_n: 1, 2, 3, 6$
 $a_0: 1, 2$

Arc Length

Arc Length Formula



$$\text{Arc Length} = 2\pi r \left(\frac{\theta}{360}\right)$$

Sector Area

Area of a Sector Formula

$$A = \frac{1}{2} r^2 \theta$$

for θ in radians

$$A = \frac{\theta}{360} \pi r^2$$

for θ in degrees

Rational Functions

Find an equation (in factored form) of a rational function, f , that satisfies the following conditions:
vertical asymptote: $x = 4$

Need factor in the denominator $x - 4 = 0$

x-intercept: $(-3, 0)$ $x + 3 = 0$

Need factor in the numerator $x + 3 = 0$

hole at $x = -1$ $x + 1 = 0$

Need same factor in numerator and denominator

horizontal asymptote: $y = -\frac{2}{5}$

Need degrees of numerator and denominator to be the same and ratio of leading coefficients = $-\frac{2}{5}$

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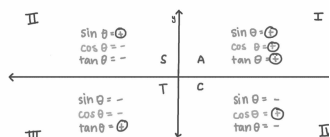
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Trig Signs

SIGNS OF TRIGONOMETRIC FUNCTIONS IN QUADRANTS



Compound Interest

Formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = final amount

P = initial principal balance

r = interest rate

n = number of times interest applied per time period

t = number of time periods elapsed

Reference Angle

Quadrant I given angle

Quadrant II 180 - given angle

Quadrant III given angle - 180

Quadrant IV 360 - given angle