Pre-Calculus 11 Enriched Trigonometry

Lesson 7 Calculating Circular Functions

Equation of the unit circle: $x^2 + y^2 = 1$

- Represents the circle with centre at the origin and radius 1 unit.

For any angle, θ in standard position, with terminal point P(x, y) on a circle with radius, r:

$\sin\theta = y$

$\cos\theta = x$

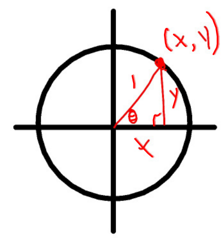
$\tan\theta = \frac{y}{x}$

reciprocal trig fcns

$\csc\theta = \frac{1}{y}$ cosecant

$\sec\theta = \frac{1}{x}$ secant

$\cot\theta = \frac{x}{y}$ cotangent



Ex. 1) Determine the value to the nearest thousandth.

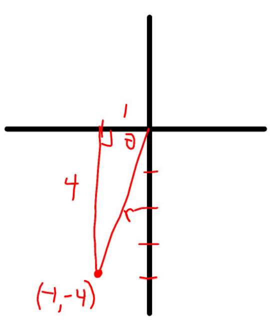
a) sec 106° $\frac{1}{\cos 106°} = -3.628$

b) csc 64° $\frac{1}{\sin 64°} = 1.113$

c) cot(−88°) $\frac{1}{\tan(-88°)} = -0.035$

or $\frac{\cos(-88°)}{\sin(-88°)}$

Ex. 2) Given P(-1, -4) is a terminal point of angle θ in standard position, determine the exact values of the six trigonometric ratios.



$1^2 + 4^2 = r^2$

$17 = r^2$

$\sqrt{17} = r$

$\sin\theta = \frac{y}{r}$

$\sin\theta = \frac{-4}{\sqrt{17}}$

$\cos\theta = \frac{x}{r}$

$\cos\theta = \frac{-1}{\sqrt{17}}$

$\tan\theta = \frac{y}{x}$

$\tan\theta = 4$

$\csc\theta = \frac{r}{y}$

$= -\frac{\sqrt{17}}{4}$

$\sec\theta = \frac{r}{x}$

$\sec\theta = -\sqrt{17}$

$\cot\theta = \frac{x}{y}$

$\cot\theta = \frac{1}{4}$

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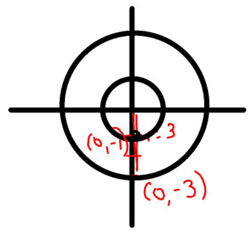
Ex. 3) Given P(0, -3) is a terminal point of an angle in standard position, determine the exact values of the 6 trigonometric ratios.



$\sin\theta = \frac{y}{r}$

$\sin\theta = \frac{-3}{3}$

$= -1$

$\csc\theta = -1$

$\cos\theta = \frac{x}{r}$

$\cos\theta = \frac{0}{3}$

$= 0$

$\sec\theta = \frac{3}{0}$

undefined

$\tan\theta = \frac{y}{x}$

$= \frac{-3}{0}$

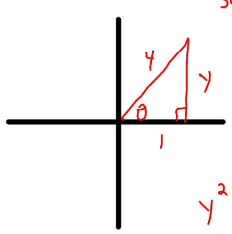
undefined

$\cot\theta = \frac{0}{-3}$

0

Ex. 4) Given $sec\theta = 4$, determine the exact values of the other trigonometric ratios for $\underbrace{0° \le \theta \le 180°}_{\text{QI and II}}$

$\sec\theta > 0$ in QI



$y^2 = 4^2 - 1^2$

$y = \sqrt{15}$

$\sec\theta = 4$

$\cos\theta = \frac{1}{4}$ $\frac{adj}{hyp}$

$\sin\theta = \frac{\sqrt{15}}{4}$

$\csc\theta = \frac{4}{\sqrt{15}}$

$\tan\theta = \sqrt{15}$

$\cot\theta = \frac{1}{\sqrt{15}}$