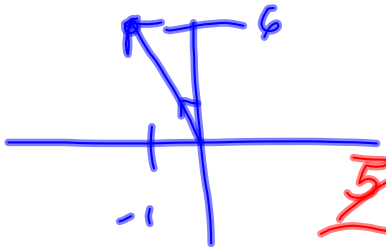
Given $\vec{v} = \langle -1, 6 \rangle$, $\vec{w} = \langle 6, 1 \rangle$

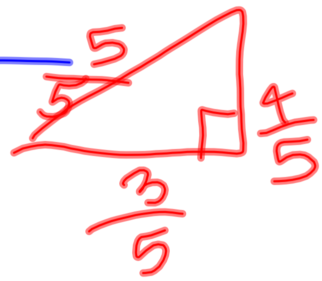
1. Find $2\vec{v} - 3\vec{w}$.

$2\langle -1,6 \rangle - 3\langle 6,1 \rangle = \langle -2,12 \rangle - \langle 18,3 \rangle = \boxed{\langle -20, 9 \rangle}$

2. Find $|\vec{v}|$.

$\sqrt{(-1)^2 + 6^2} = \sqrt{37}$





3. Find $|\vec{w}|$.

$\sqrt{6^2 + 1^2} = \sqrt{37}$

4. Find $\vec{v} \cdot \vec{w}$.

$(-1)(6) + 6(1) = 0$

5. Find the angle θ between $\vec{v}$ and $\vec{w}$.

$\theta = \cos^{-1}\left(\frac{\vec{v} \cdot \vec{w}}{|\vec{v}||\vec{w}|}\right) = \cos^{-1}\left(\frac{0}{\sqrt{37}\sqrt{37}}\right) = \cos^{-1}(0) = 90°$

6. Find a unit vector $\vec{u}$ in the same direction as $\vec{v}$.

$\left\langle \frac{-1}{\sqrt{37}}, \frac{6}{\sqrt{37}} \right\rangle = \left\langle \frac{-\sqrt{37}}{37}, \frac{6\sqrt{37}}{37} \right\rangle$

7.6

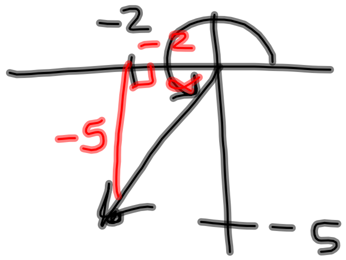
37. $\vec{r} = \langle -2, -8 \rangle$

$|\vec{r}| = \sqrt{(-2)^2 + (-8)^2} = \sqrt{4 + 64} = \sqrt{68} = 2\sqrt{17}$

$\vec{u} = \left\langle \frac{-2}{2\sqrt{17}}, \frac{-8}{2\sqrt{17}} \right\rangle$

$= \left\langle \frac{-1}{\sqrt{17}}, \frac{-4}{\sqrt{17}} \right\rangle = \left\langle \frac{-\sqrt{17}}{17}, \frac{-4\sqrt{17}}{17} \right\rangle$

53. $\vec{u} = \langle -2, -5 \rangle$



$$\tan\alpha = \left|\frac{b}{a}\right|$$

$$\alpha = \tan^{-1}\left|\frac{-5}{-2}\right| = 68.2^\circ$$

$$\theta = \alpha + 180^\circ = \boxed{248.2^\circ}$$

Find the radius (in cm) of a circle that contains an arc of length 8m, subtending a 100° angle.

$s = 8m$; $\theta = 100^\circ$; $r = ?\,cm$

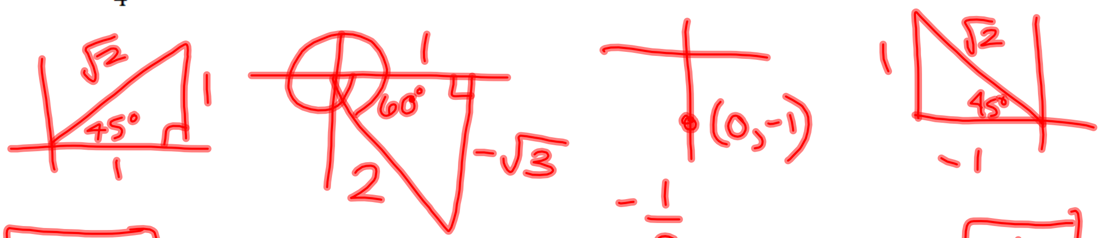
$$\frac{s}{\theta} = \frac{r\theta}{\theta} \qquad r = \frac{s}{\theta}$$

$$\begin{array}{r} {}^{6}180 \\ \times\ 8 \\ \hline 1440 \end{array}$$

$$r = \frac{8\cancel{m}}{\cancel{100^\circ}} \cdot \frac{\cancel{100}\ cm}{1\cancel{m}} \cdot \frac{180^{\cancel{\circ}}}{\pi} = \boxed{\frac{1440}{\pi}\ cm}$$

Evaluate the following trigonometric expressions:

1. $\sec\frac{\pi}{4}$ 2. $\cos(-420°)$ 3. $\tan(-90°)$ 4. $\sin 135°$



$\boxed{\sqrt{2}}$ $\boxed{\frac{1}{2}}$ $-\frac{1}{0}$ $\boxed{\text{undefined}}$ $\boxed{\frac{1}{\sqrt{2}}}$

Solve for x. (all solutions, no restrictions)

$\sin(2x) - \sin(x) = 0$

$2\sin x\cos x - \sin x = 0$

$\sin x(2\cos x - 1) = 0$

$\sin x = 0$ $\cos x = \frac{1}{2}$

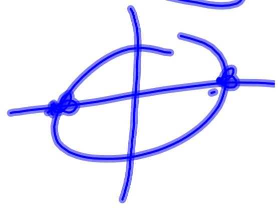
$x = 0 + 2\pi k$

$x = \pi + 2\pi k$

$\boxed{x = \pi k}$

$x = \frac{\pi}{3} + 2\pi k$

$x = \frac{5\pi}{3} + 2\pi k$



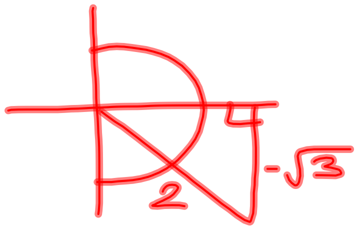
Evaluate the inverse functions. Give your answers in radians.

1. $\csc^{-1}\left(-\frac{2}{\sqrt{3}}\right) = \boxed{-\frac{\pi}{3}}$

2. $\cot^{-1}(\sqrt{3}) = \frac{\sqrt{3}}{1} = \boxed{\frac{\pi}{6}}$

$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$:
sin
csc
tan

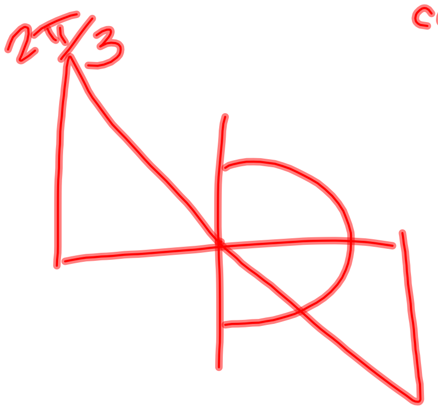
$(0, \pi)$:
cos
sec
cot



Evaluate.

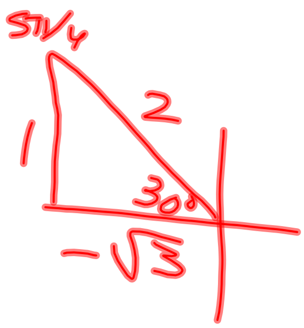
1. $\sin^{-1}\left(\sin\frac{\pi}{5}\right) = \boxed{\frac{\pi}{5}}$

2. $\tan^{-1}\left(\tan\frac{2\pi}{3}\right) = \boxed{-\frac{\pi}{3}}$



Given that $\tan\frac{x}{2} = \frac{1-\cos x}{\sin x}$, evaluate $\tan\frac{5\pi}{12}$.

$$\tan\frac{5\pi/6}{2} = \frac{1-\cos\frac{5\pi}{6}}{\sin\frac{5\pi}{6}} = \frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{2}}$$



$$= \left(1+\frac{\sqrt{3}}{2}\right)\cdot\frac{2}{1}$$

$$= \boxed{2+\sqrt{3}}$$

Prove.

$\sin 3x = 3\sin x - 4\sin^3 x$

$LHS = \sin(2x + x) =$

$= \sin 2x \cos x + \cos 2x \sin x =$

$= (2\sin x\cos x)\cos x + (\cos^2 x - \sin^2 x)\sin x =$

$= 2\sin x\cos^2 x + \sin x\cos^2 x - \sin^3 x =$

$= 3\sin x\cos^2 x - \sin^3 x =$

$= 3\sin x(1-\sin^2 x) - \sin^3 x =$

$= 3\sin x - 3\sin^3 x - \sin^3 x =$

$= 3\sin x - 4\sin^3 x = RHS$.

Find the exact value of $\cos\frac{\pi}{12}\cos\frac{\pi}{4} - \sin\frac{\pi}{12}\sin\frac{\pi}{4}$.

$= \cos\left(\frac{\pi}{12} + \frac{\pi}{4}\right) =$

$= \cos\left(\frac{\pi}{12} + \frac{3\pi}{12}\right) = \cos\frac{4\pi}{12} =$

$= \cos\frac{\pi}{3} = \boxed{\frac{1}{2}}$

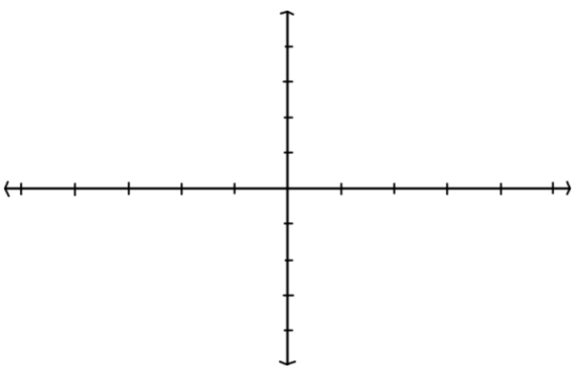
$f(x) = -3\csc\left(4x + \frac{\pi}{2}\right) - 2$

a. "amplitude"

b. period

c. horizontal shift

d. vertical shift



$f(x) = \frac{2}{3}\cot\left(3x - \frac{3\pi}{4}\right) + 1$

e. "amplitude"

f. period

g. horizontal shift

h. vertical shift