Expand and simplify: $\cos(90° - \theta)$

$\cos 90° \cos\theta + \sin 90° \sin\theta$

$= 0 \cdot \cos\theta + 1 \cdot \sin\theta$

$= \boxed{\sin\theta}$

$\cos(a-b) = \cos a \cos b + \sin a \sin b$

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

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

$= 2\cos^2 x - 1 = \boxed{1 - 2\sin^2 x}$

Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $2\sin^2 2x = 1 - \cos 2x$

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

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

$2(4\sin^2 x \cos^2 x) = 1 - \cos 2x$

$8\sin^2 x \cos^2 x = 1 - \cos 2x$

$8\sin^2 x \cos^2 x = 1 - (1 - 2\sin^2 x)$

$8\sin^2 x \cos^2 x = 2\sin^2 x$

$8\sin^2 x \cos^2 x - 2\sin^2 x = 0$

$2\sin^2 x(4\cos^2 x - 1) = 0$

$2\sin^2 x = 0 \qquad 4\cos^2 x - 1 = 0$

$\sin^2 x = 0 \qquad \cos^2 x = \frac{1}{4}$

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

$\boxed{x = 0, \pi} \qquad x = \boxed{\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}}$

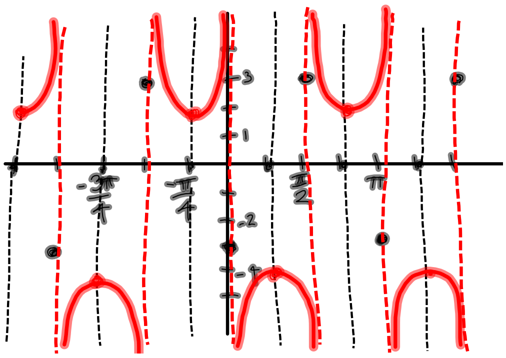
Graph $y = -3\sec\left(2x + \frac{3\pi}{2}\right) - 1$ using transformations.

"amp": 3

per: $\frac{2\pi}{2} = \pi$

h.shift: left $\frac{3\pi}{4}$

v.shift: down 1




Homework questions?

~~7.6~~

~~2. $\overrightarrow{CD}$; C(1,5), D(5,7)~~

$\vec{w} = \langle -1, -3 \rangle$

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

22. $10\left|7\vec{w} - 3\vec{u}\right|$

$= 10\left|\langle -7, -21 \rangle - \langle 15, -6 \rangle\right|$

$= 10\left|\langle -22, -15 \rangle\right|$

$= 10\sqrt{(-22)^2 + (-15)^2} = \boxed{10\sqrt{709}}$

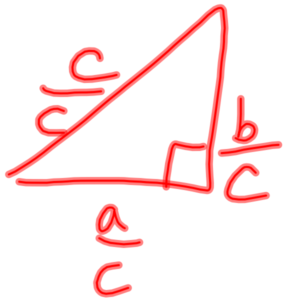
$\vec{v} = \langle a, b \rangle$

$|\vec{v}| = \sqrt{a^2 + b^2}$

Given a vector $\vec{v} = < a, b >$, we can find a **<u>unit vector $\vec{u}$ in the direction of $\vec{v}$</u>** by dividing each component (a & b) by the magnitude $|\vec{v}|$.

$\vec{v} = \langle a, b \rangle$

$|\vec{v}| = \sqrt{a^2+b^2}$




$$\vec{u} = \frac{\vec{v}}{|\vec{v}|} = \left\langle \frac{a}{\sqrt{a^2+b^2}}, \frac{b}{\sqrt{a^2+b^2}} \right\rangle$$

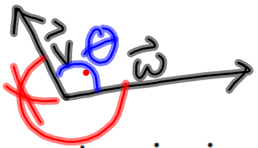
Given $\vec{v} = < -3, 4 >$, find a unit vector $\vec{u}$ in the direction of $\vec{v}$.

$|\vec{v}| = \sqrt{(-3)^2+4^2} = \sqrt{9+16} = \sqrt{25} = 5$

$\vec{u} = \boxed{\left\langle \frac{-3}{5}, \frac{4}{5} \right\rangle}$

Verify: $|\vec{u}| = \sqrt{\left(\frac{-3}{5}\right)^2 + \left(\frac{4}{5}\right)^2} =$

$\sqrt{\frac{9}{25} + \frac{16}{25}} = \sqrt{\frac{25}{25}} = \sqrt{1} = 1$ ✓




7.6 Vectors, cont.

The smallest nonnegative angle between two vectors is given by

$\cos\theta = \frac{\vec{v}\cdot\vec{w}}{|\vec{v}||\vec{w}|}$ , or equivalently, $\boxed{\theta = \cos^{-1}\frac{\vec{v}\cdot\vec{w}}{|\vec{v}||\vec{w}|}}$.

Recall that both the dot product and magnitude vector operations yield a scalar (non-vector real number) quantity, so we can find the inverse cosine value.

Given $\vec{v} = \langle a, b\rangle$ and $\vec{w} = \langle c, d\rangle$,

$$|\vec{v}| = \sqrt{a^2 + b^2}$$

$$\vec{v}\cdot\vec{w} = ac + bd$$

7.6 #64. Given $\vec{a} = \langle -3, -3\rangle$ and $\vec{b} = \langle -5, 2\rangle$, find the smallest non-negative angle between $\vec{a}$ and $\vec{b}$.

$$\cos\theta = \frac{\vec{v_1}\cdot\vec{v_2}}{|\vec{v_1}||\vec{v_2}|} = \frac{\vec{a}\cdot\vec{b}}{|\vec{a}||\vec{b}|} \qquad \theta = \cos^{-1}\left(\frac{\vec{a}\cdot\vec{b}}{|\vec{a}||\vec{b}|}\right)$$

$$\vec{a}\cdot\vec{b} = -3(-5) + (-3)(2) = 15 - 6 = 9$$

$$|\vec{a}| = \sqrt{(-3)^2 + (-3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$$

$$|\vec{b}| = \sqrt{(-5)^2 + 2^2} = \sqrt{25+4} = \sqrt{29}$$

$$\theta = \cos^{-1}\left(\frac{9}{3\sqrt{2}\cdot\sqrt{29}}\right) \approx \boxed{66.8^\circ}$$

cos^-1 (9/(3sqrt(2·29)))

68. $\vec{u} = 3\vec{i} + 2\vec{j}$ ; $\vec{v} = -\vec{i} + 4\vec{j}$

$= \langle 3,2 \rangle$ $= \langle -1,4 \rangle$

$\vec{u} \cdot \vec{v} = 3(-1) + 2(4) = -3 + 8 = 5$

$|\vec{u}| = \sqrt{3^2+2^2} = \sqrt{9+4} = \sqrt{13}$

$|\vec{v}| = \sqrt{(-1)^2+4^2} = \sqrt{1+16} = \sqrt{17}$

$$\theta = \cos^{-1}\left(\frac{\vec{u}\cdot\vec{v}}{|\vec{u}||\vec{v}|}\right) = \cos^{-1}\left(\frac{5}{\sqrt{13}\sqrt{17}}\right) = \boxed{70.3^\circ}$$

Verify the identity. Show all steps.

$$\cos \overset{a}{5x} \cos \overset{b}{3x} + \sin \overset{a}{5x} \sin \overset{b}{3x} = 1 - 2\sin^2 x$$

$LHS = \cos(5x - 3x) =$

$= \cos 2x =$

$= 1 - 2\sin^2 x = RHS$ ✓

HW:
7.6 #
33-47
53-57 } odd
63-67