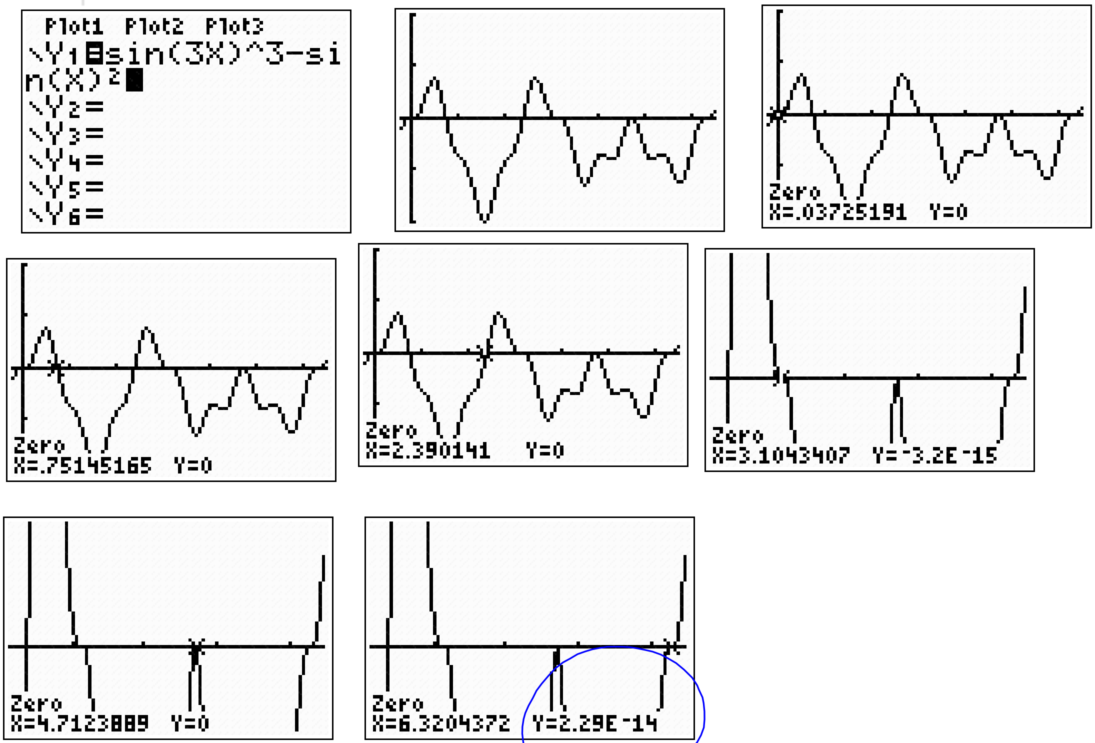
16. –/2 points LarTrig9 2.5.064.

Find all solutions of the equation in the interval $[0, 2\pi)$. (Enter your answers as a comma-separated list.)

$$\sin^2 3x - \sin^2 x = 0$$

Use a graphing utility to graph the equation and verify the solutions.



All these solutions are in decimal radians.

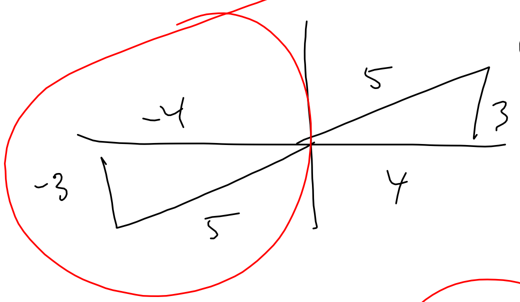
For degree answers, multiply by $\frac{180°}{\pi}$.

2.29×10^{-14}

$.0000000000000229 \approx 0$

From Fall '19 Test 2

(2) $\tan u = \frac{3}{4}$ $\quad \cos u < 0$



sin

(2)

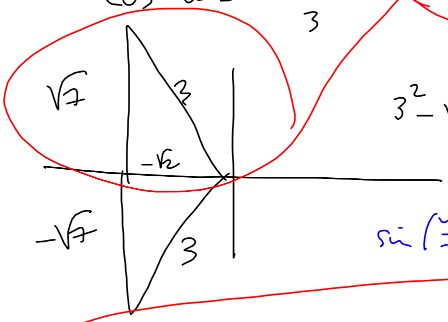
$\sin u = -\frac{3}{5}$ $\qquad \csc u = -\frac{5}{3}$

$\cos u = -\frac{4}{5}$ $\qquad \sec u = -\frac{5}{4}$

$\tan u = \frac{3}{4}$ $\qquad \cot u = \frac{4}{3}$

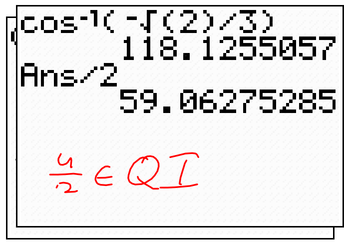
$\cos u = -\frac{\sqrt{2}}{3}$ $\quad \sin u > 0$

Find $\sin\left(\frac{u}{2}\right)$, $\cos\left(\frac{u}{2}\right)$, $\tan\left(\frac{u}{2}\right)$



$3^2 - \sqrt{2}^2 = 9 - 2 = 7$

This is already chan



$\frac{u}{2} \in QI$

$\sin\left(\frac{u}{2}\right) = \pm\sqrt{\frac{1-\cos(u)}{2}}$

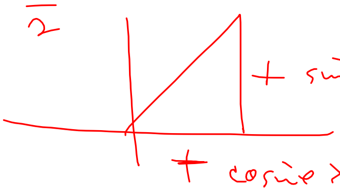
$90^\circ < u < 180^\circ$

$45^\circ < \frac{u}{2} < 90^\circ$ QI

Another way:

$\cos^{-1}\left(-\frac{\sqrt{2}}{3}\right) \approx 118.1255057^\circ$

$\frac{u}{2}$



$+$ sine > 0

$+$ cosine > 0

$118.\ldots^\circ/2 \approx 59.\ldots^\circ \in QI$

So $\sin\left(\frac{u}{2}\right) = + \sqrt{\frac{1-\cos u}{2}} = \sqrt{\frac{1-\left(-\frac{\sqrt{2}}{3}\right)}{2}} = \sqrt{\frac{\frac{3+\sqrt{2}}{3}}{2}}$

$$\boxed{= \sqrt{\frac{3+\sqrt{2}}{6}} = \sin\left(\frac{u}{2}\right)}$$

$\cos\left(\frac{u}{2}\right) = \sqrt{\frac{1+\cos(u)}{2}}$ $\boxed{= \cdots \sqrt{\frac{3-\sqrt{2}}{6}} = \cos\left(\frac{u}{2}\right)}$

$\tan\frac{u}{2} = \frac{\sin\left(\frac{u}{2}\right)}{\cos\left(\frac{u}{2}\right)} = \sqrt{\frac{3+\sqrt{2}}{6}}\sqrt{\frac{6}{3-\sqrt{2}}}$

$A = \sqrt{\frac{3+\sqrt{2}}{3-\sqrt{2}}}$ isn't simplified radical form, but it's more work than the points you get to go farther.

Scratch:

$\frac{(3+\sqrt{2})(3+\sqrt{2})}{(3-\sqrt{2})(3+\sqrt{2})}$

$(a+b)^2 = a^2 + 2ab + b^2$

$= \frac{9+(2\sqrt{2})(3)+(\sqrt{2})^2}{3^2-\sqrt{2}^2} = \frac{9+6\sqrt{2}+2}{9-2}$

$= \sqrt{\frac{11+6\sqrt{2}}{7}\cdot\frac{7}{7}} = \frac{77+42\sqrt{2}}{49}$

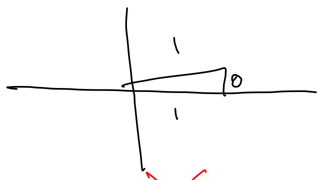
$A = \sqrt{\frac{77+42\sqrt{2}}{49}} = \frac{\sqrt{77+42\sqrt{2}}}{7}$

$4\cos^3 x - 4\cos^2 x - 3\cos x + 3$

$= (4\cos^2 x)(\cos x - 1) - 3(\cos x - 1)$

$(\cos x - 1)(4\cos^2 x - 3)$

$\cos x = 1$

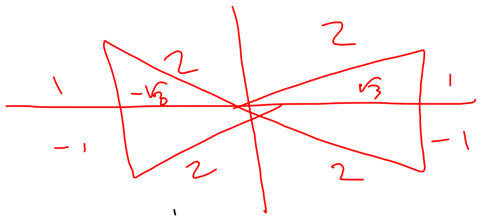


$x = 0, \cancel{2\pi}$

$4\cos^2 x = 3$

$\cos^2 x = \frac{3}{4}$

$\cos x = \pm\sqrt{\frac{3}{4}} = \pm\frac{\sqrt{3}}{2}$



$30°, 150°, 210°, 330°$

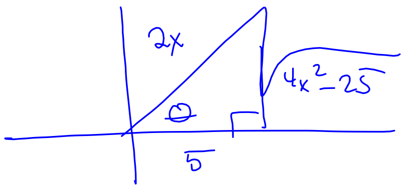
$x \in \{0°, 30°, 150°, 210°, 330°\}$

4b

$\{0, \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}\}$

$x \in \{\theta + 2n\pi \mid \theta = 0, \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}, n \in \mathbb{Z}\}$

5 $\tan\left(\arccos\left(\frac{5}{2x}\right)\right) = \tan\theta$ 1.5



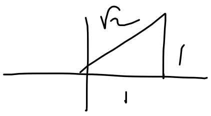
$$\sqrt{(2x)^2 - 5^2} = \sqrt{4x^2 - 25}$$

$$\Rightarrow \boxed{\tan\theta = \frac{\sqrt{4x^2-25}}{5}}$$

6) $\sin\frac{7\pi}{12} =$

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

$$= \sin\frac{\pi}{4}\cos\frac{\pi}{3} + \sin\frac{\pi}{3}\cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}\cdot\frac{1}{2} + \frac{\sqrt{3}}{2}\cdot\frac{1}{\sqrt{2}}$$

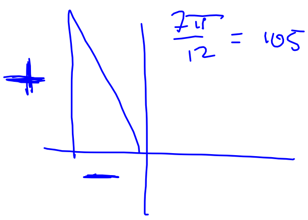


$$= \left(\frac{1+\sqrt{3}}{2\sqrt{2}}\right)\left(\frac{\sqrt{2}}{\sqrt{2}}\right) = \boxed{\frac{\sqrt{2}+\sqrt{6}}{2\cdot 2}}$$

$$\boxed{= \frac{\sqrt{2}+\sqrt{6}}{4}} \qquad \boxed{= \frac{\sqrt{2}+\sqrt{6}}{4}}$$

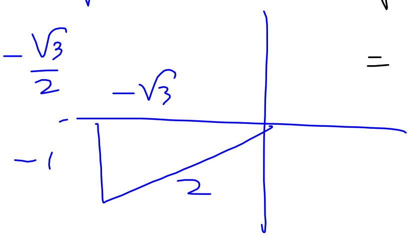
b) $\sin\left(\frac{7\pi}{12}\right) = \sin\left(\frac{\left(\frac{7\pi}{6}\right)}{2}\right) = \sin\frac{u}{2}$ where $u = \frac{7\pi}{6}$

$$\sin\frac{u}{2} = \pm\sqrt{\frac{1-\cos(u)}{2}} = +\sqrt{\frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{2}} = \sqrt{\frac{2+\sqrt{3}}{4}}$$



$\frac{7\pi}{12} = 105^0$

$\cos\frac{7\pi}{6} = -\frac{\sqrt{3}}{2}$



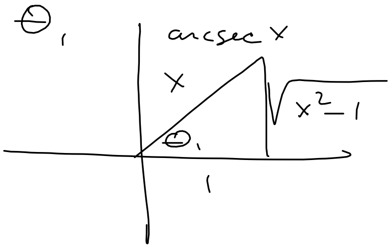
$$= \boxed{\frac{\sqrt{2+\sqrt{3}}}{2} = \sin\frac{7\pi}{12}}$$

$$\cos(\operatorname{arcsec} x + \arctan x) = \cos(\theta_1 + \theta_2)$$

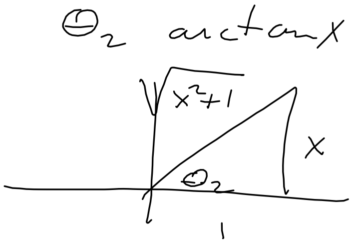
$$= \cos\theta_1 \cos\theta_2 - \sin\theta_1 \sin\theta_2$$

$$= \cos(\operatorname{arcsec} x)\cos(\arctan x) - \sin(\operatorname{arcsec} x)\sin(\arctan x)$$

θ_1

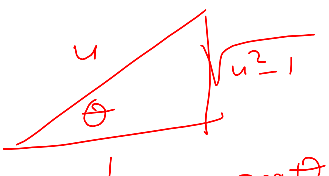


θ_2

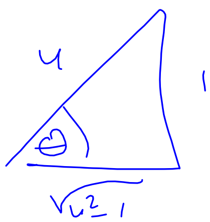


$$= \frac{1}{x}\cdot\frac{1}{\sqrt{x^2+1}} - \frac{\sqrt{x^2-1}}{x}\cdot\frac{x}{\sqrt{x^2+1}} = \boxed{\frac{1 - x\sqrt{x^2-1}}{x\sqrt{x^2+1}}}$$

For: $\int u\sqrt{u^2-1}\,du$



$u = \sec\theta$



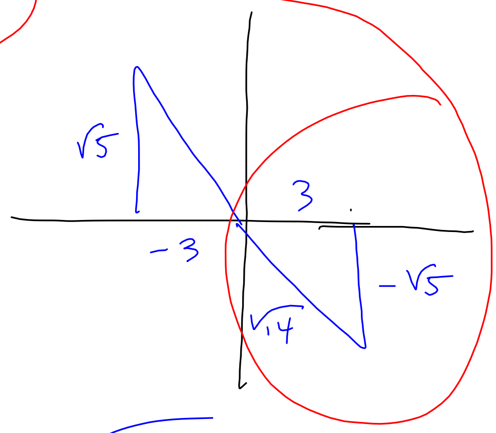
$u = \csc\theta$

etc.

Trigonometric substitution in CALC II Test 2

$\tan u = -\frac{\sqrt{5}}{3}$, $\cos u > 0$

Want $\sin(2u)$, $\cos(2u)$



$\sin(2u) = 2\sin u\cos u$

$= 2\left(-\frac{\sqrt{5}}{\sqrt{14}}\right)\left(\frac{3}{\sqrt{14}}\right)$

$= \frac{-6\sqrt{5}}{14} = \frac{-3\sqrt{5}}{7} = \sin(2u)$

$\sqrt{3^2+5} = \sqrt{14}$

$\cos(2u) = 1 - 2\sin^2 u$ OR $\cos^2 u - \sin^2 u$

$= 1 - 2\left(\frac{-\sqrt{5}}{\sqrt{14}}\right)^2 = 1 - \frac{2\cdot 5}{14} = 1 - \frac{5}{7} = \boxed{\frac{2}{7} = \cos(2u)}$

Shawn

$\left(\frac{3}{\sqrt{14}}\right)^2 - \left(\frac{-\sqrt{5}}{\sqrt{14}}\right)^2 = \frac{9-5}{14} = \frac{2}{14}$

$\sin\left(\frac{3\pi}{8}\right)$ Doesn't lend itself to angle-sum formula.

$3 = 4 - 1$
$= 5 - 2$
$= 6 - 3$ $\Big\}$ No joy

$d = 2r = 14''$, $s = 500$ yds

$r = 7$

$s = r\theta$

$\left(\frac{36''}{1\text{ yd}}\right)(500\text{ yds}) = 7\theta$

$\frac{(36)(500)}{7} = \theta \longrightarrow$ revs are:

$\left(\frac{(36)(500)}{7}\text{ radians}\right)\left(\frac{1\text{ rev}}{2\pi\text{ radians}}\right)$

$= \frac{(36)(250)}{11}$ revolutions

$6\sin^2\left(\frac{x}{2}\right)+\sin\left(\frac{x}{2}\right)-2=0$