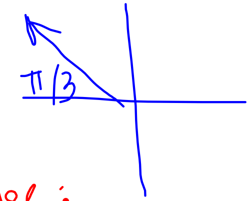
1. Evaluate the following.

(a) $\cos^{-1}(-\frac{1}{2}) \overset{\text{set}}{=} \theta$

Range:

$\cos\theta = -1/2$, θ in $[0, \pi]$

Ref Angle: $\pi/3$ in QII



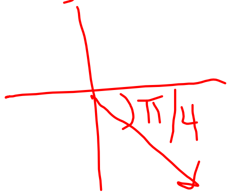
$\boxed{\frac{2\pi}{3}}$

(b) $\sin^{-1}(-\frac{\sqrt{2}}{2}) \overset{\text{set}}{=} \theta$

Range:

$\sin\theta = -\frac{\sqrt{2}}{2}$, θ in $[-\frac{\pi}{2}, \frac{\pi}{2}]$

Ref Angle: $\frac{\pi}{4}$ in QIV

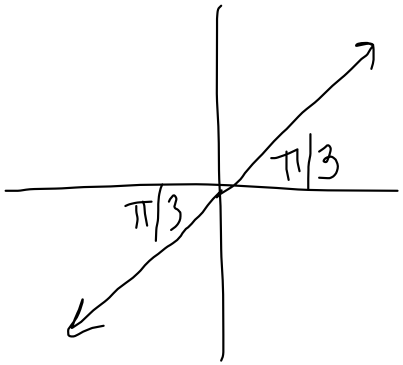


$\boxed{-\frac{\pi}{4}}$

(c) $\tan^{-1}(\tan\frac{4\pi}{3}) = \theta$

Range:

$\tan\theta = \tan\frac{4\pi}{3}$, but θ must be in $(-\frac{\pi}{2}, \frac{\pi}{2})$

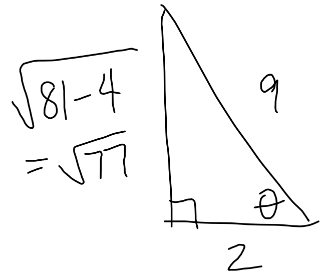


$\boxed{\frac{\pi}{3}}$

(d) $\csc(\underbrace{\sec^{-1}\tfrac{9}{2}})$

Let $\sec^{-1}\frac{9}{2} = \theta$

$\sec\theta = \frac{9}{2}$

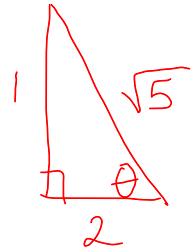


$\csc\left(\sec^{-1}\frac{9}{2}\right) = \csc\theta = \boxed{\dfrac{9}{\sqrt{77}}}$

(e) $\sec(2\underbrace{\tan^{-1}\tfrac{1}{2}})$

$\tan^{-1}\frac{1}{2} = \theta$

$\tan\theta = \frac{1}{2}$



$$\sec\left(2\tan^{-1}\frac{1}{2}\right) = \sec 2\theta$$

$$= \frac{1}{\cos 2\theta} = \frac{1}{\cos^2\theta - \sin^2\theta}$$

$$= \frac{1}{\left(\frac{2}{\sqrt{5}}\right)^2 - \left(\frac{1}{\sqrt{5}}\right)^2}$$

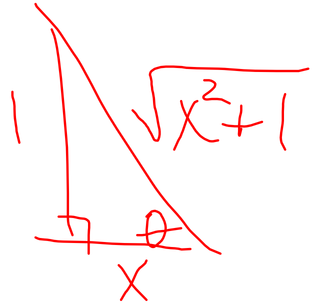
$$= \frac{1}{\frac{4}{5} - \frac{1}{5}} = \frac{1}{3/5}$$

$$= \boxed{\frac{5}{3}}$$

2. Express $\sin(2\cot^{-1} x)$ as an algebraic expression in x.

$$\cot^{-1} x = \theta$$

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



$$\sin(2\cot^{-1} x) = \sin(2\theta)$$

$$= 2\sin\theta\cos\theta$$

$$= 2\left(\frac{1}{\sqrt{x^2+1}}\right)\left(\frac{x}{\sqrt{x^2+1}}\right)$$

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

3. Find all solutions to the following trig equations.

(a) $2\cos^2 u = 1 - \cos u$

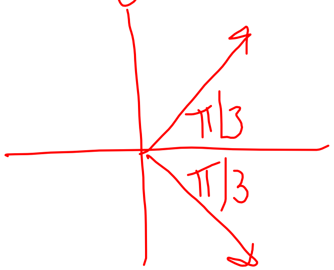
$$2\cos^2 u + \cos u - 1 = 0$$

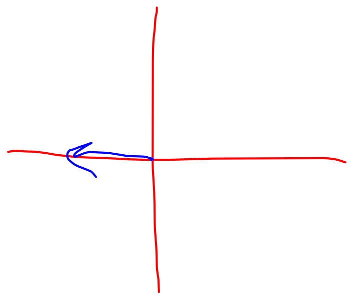
$$(2\cos u - 1)(\cos u + 1) = 0$$

$$2\cos u - 1 = 0 \qquad \cos u + 1 = 0$$

$$\cos u = \frac{1}{2} \qquad \cos u = -1$$

Ref angle: $\frac{\pi}{3}$ $\qquad$ $u = \pi$ in $[0, 2\pi)$





$$\boxed{u = \frac{\pi}{3} + 2k\pi,\ \frac{5\pi}{3} + 2k\pi,\ \pi + 2k\pi,\ k \text{ is any integer}}$$

(b) $\underbrace{3\tan^3 x - 3\tan^2 x}\underbrace{- \tan x + 1} = 0$

$3\tan^2 x\,(\tan x - 1) - (\tan x - 1) = 0$

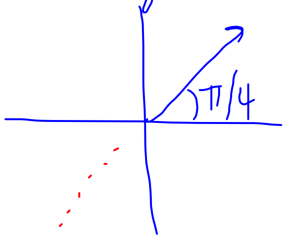
$(\tan x - 1)(3\tan^2 x - 1) = 0$

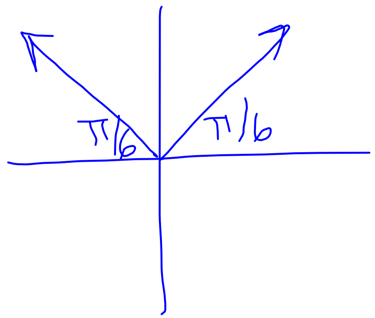
$\tan x - 1 = 0$ $\qquad$ $3\tan^2 x - 1 = 0$

$\tan x = 1$ $\qquad$ $\tan^2 x = \frac{1}{3}$

Ref. Angle: $\frac{\pi}{4}$ $\qquad$ $\tan x = \pm \frac{1}{\sqrt{3}}$

Ref Angle: $\frac{\pi}{6}$



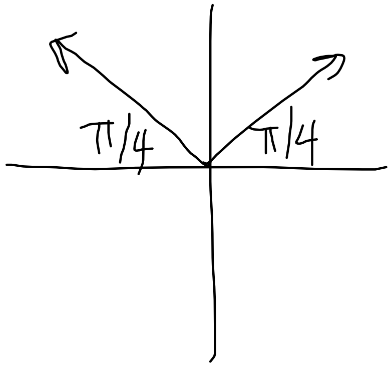


In $[0, \pi)$: $x = \frac{\pi}{4}, \frac{\pi}{6}, \frac{5\pi}{6}$

$$\boxed{\text{All: } x = \frac{\pi}{4} + k\pi,\ \frac{\pi}{6} + k\pi,\ \frac{5\pi}{6} + k\pi \quad k \text{ any integer}}$$

(c) $\sin \frac{x}{5} = \frac{1}{\sqrt{2}}$

Ref Angle: $\frac{\pi}{4}$



$$\frac{x}{5} = \frac{\pi}{4} + 2k\pi, \quad \frac{3\pi}{4} + 2k\pi$$

$$\boxed{x = \frac{5\pi}{4} + 10k\pi, \quad \frac{15\pi}{4} + 10k\pi, \quad k \text{ any integer}}$$

4. (i) Find all solutions to the equation. (ii) Find all solutions in the interval $[0, 2\pi)$.

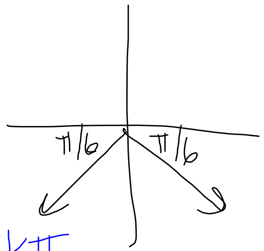
$$\underbrace{\sin 100x \cos 96x - \cos 100x \sin 96x}_{\sin(100x - 96x)} = -\tfrac{1}{2}$$

$\sin(x-y) = \sin x \cos y - \cos x \sin y$

$\sin(100x - 96x) = -1/2$

$\sin 4x = -1/2$

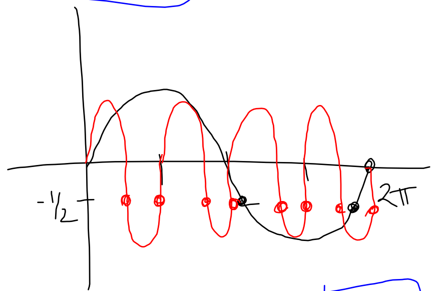
Ref Angle: $\frac{\pi}{6}$



$4x = \frac{7\pi}{6} + 2k\pi, \ \frac{11\pi}{6} + 2k\pi$

$$\boxed{x = \frac{7\pi}{24} + \frac{k\pi}{2}, \ \frac{11\pi}{24} + \frac{k\pi}{2}}$$

# of solutions: 8



$k=0$: $\boxed{\frac{7\pi}{24}, \ \frac{11\pi}{24}}$

$k=1$: $\frac{7\pi}{24} + \frac{\pi}{2} = \boxed{\frac{19\pi}{24}}$

$\frac{11\pi}{24} + \frac{\pi}{2} = \boxed{\frac{23\pi}{24}}$

$k=2$: $\frac{7\pi}{24} + \pi = \boxed{\frac{31\pi}{24}}$

$\frac{11\pi}{24} + \pi = \boxed{\frac{35\pi}{24}}$

$k=3$: $\frac{7\pi}{24} + \frac{3\pi}{2} = \boxed{\frac{43\pi}{24}}$

$\frac{11\pi}{24} + \frac{3\pi}{2} = \boxed{\frac{47\pi}{24}}$

5. A vector $\mathbf{u}$ has initial point $(-4, 3)$ and terminal point $(-1, -2)$, and $\mathbf{v} = <7, 2>$.

(a) Calculate $\mathbf{u} + \mathbf{v}$

$$\vec{u} = \langle -1-(-4), -2-3 \rangle = \langle 3, -5 \rangle$$

$$\vec{u} + \vec{v} = \langle 3, -5 \rangle + \langle 7, 2 \rangle = \boxed{\langle 10, -3 \rangle}$$

(b) Calculate $|\mathbf{v} - 2\mathbf{u}|$

$$\vec{v} - 2\vec{u} = \langle 7, 2 \rangle - 2\langle 3, -5 \rangle = \langle 7, 2 \rangle + \langle -6, 10 \rangle = \langle 1, 12 \rangle$$

$$|\vec{v} - 2\vec{u}| = \sqrt{1^2 + 12^2} = \boxed{\sqrt{145}}$$

(c) Calculate $\mathbf{u} \cdot \mathbf{v}$

$$\langle 3, -5 \rangle \cdot \langle 7, 2 \rangle = 3(7) + (-5)(2) = 21 - 10 = \boxed{11}$$

(d) Find the angle between $\mathbf{u}$ and $\mathbf{v}$ to four decimal places.

$$\cos\theta = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}||\vec{v}|} = \frac{11}{\sqrt{34} \cdot \sqrt{53}} \Rightarrow \theta = \cos^{-1}\left(\frac{11}{\sqrt{34}\sqrt{53}}\right) \approx \boxed{74.9816^\circ}$$

$$|\vec{u}| = \sqrt{3^2 + (-5)^2} = \sqrt{34}$$

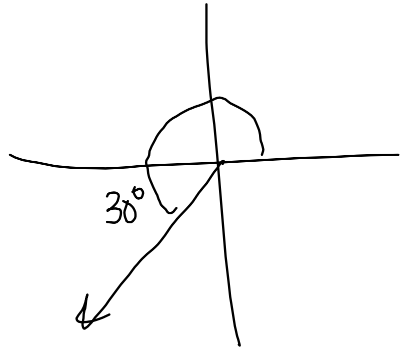
$$|\vec{v}| = \sqrt{7^2 + 2^2} = \sqrt{53}$$

(e) Find a unit vector that has the same direction as $\mathbf{v}$.

$$\vec{v} = \langle 7, 2 \rangle \qquad |\vec{v}| = \sqrt{53}$$

$$\frac{\vec{v}}{|\vec{v}|} = \frac{\langle 7, 2 \rangle}{\sqrt{53}} = \frac{1}{\sqrt{53}}\langle 7, 2 \rangle = \boxed{\left\langle \frac{7}{\sqrt{53}}, \frac{2}{\sqrt{53}} \right\rangle}$$

6. If $|\mathbf{v}| = 3$ and $\theta = 210°$, what is the vector $\mathbf{v}$ in component form?



$$\vec{v} = \langle |\vec{v}|\cos\theta \ , \ |\vec{v}|\sin\theta \rangle$$

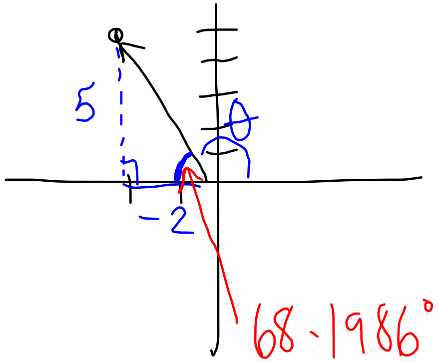
$$= \langle 3\cos 210°, \ 3\sin 210° \rangle$$

$$= \langle -3\cos 30°, -3\sin 30° \rangle$$

$$= \langle -3\left(\frac{\sqrt{3}}{2}\right), -3\left(\frac{1}{2}\right) \rangle$$

$$= \boxed{\langle \frac{-3\sqrt{3}}{2}, -\frac{3}{2} \rangle}$$

7. Find the direction of the vector $\mathbf{u} = \langle -2, 5 \rangle$ to four decimal places.



$$\tan\theta = \frac{5}{-2}$$

$$\tan^{-1}\left(\frac{5}{-2}\right) \approx -68.1986°$$

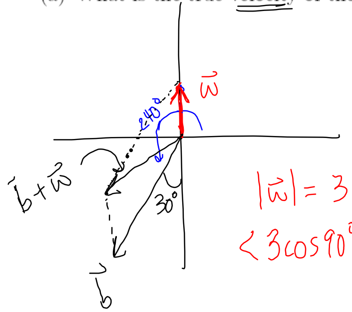
Ref Angle: 68.1986°

$$\theta = 180 - 68.1986°$$

$$\approx \boxed{111.8014°}$$

8. A boat is traveling at 15 mi/hr with a bearing of S 30° W relative to the water. The water is flowing due north at 3 mi/hr.

(a) What is the true velocity of the boat?



$|\vec{b}| = 15, \quad \theta = 240°$

$\vec{b} = \langle 15\cos 240°, 15\sin 240° \rangle$

$= \langle -15\cos 60°, -15\sin 60° \rangle$

$= \langle -15(1/2), -15(\sqrt{3}/2) \rangle$

$= \langle \frac{-15}{2}, \frac{-15\sqrt{3}}{2} \rangle$

$|\vec{w}| = 3, \quad \theta = 90°$

$\langle 3\cos 90°, 3\sin 90° \rangle$

$= \vec{w} = \langle 0, 3 \rangle$

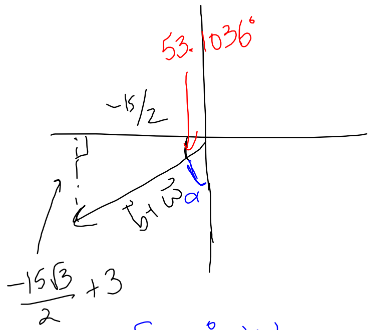
true velocity: $\vec{b} + \vec{w}$

$= \boxed{\langle \frac{-15}{2}, \frac{-15\sqrt{3}}{2} + 3 \rangle}$

(b) What are the true speed and bearing of the boat?

true Speed = |true velocity| $= \sqrt{\left(\frac{-15}{2}\right)^2 + \left(\frac{-15\sqrt{3}}{2} + 3\right)^2}$

$\approx$ 12.4923 mph



$\tan\theta = \dfrac{\frac{-15\sqrt{3}}{2} + 3}{\frac{-15}{2}}$

$\tan^{-1}(\ \downarrow\ ) = 53.1036°$

S α° W

$\alpha = 90 - 53.1036° = 36.8964°$

$\boxed{\text{S } 36.8964° \text{ W}}$

"Direction" would be: $180 + 53.1036° = 233.1036°$

9. Let $\mathbf{u} = -9\mathbf{i} + 5\mathbf{j}$ and $\mathbf{v} = a\mathbf{i} - 6\mathbf{j}$. Find the value of a that would make these vectors orthogonal.

orthognal when $\vec{u} \cdot \vec{v} = 0$

$$\vec{u} \cdot \vec{v} = (-9)(a) + (5)(-6) = -9a - 30$$

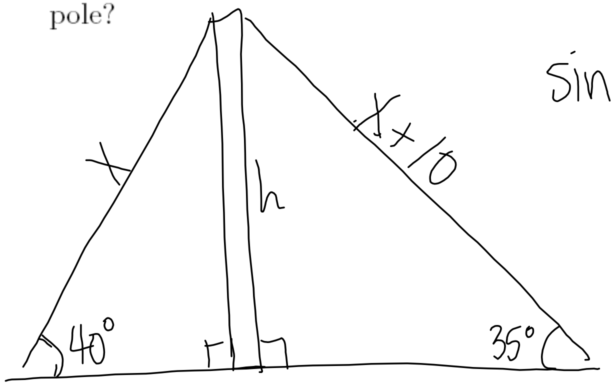
$$-9a - 30 = 0$$

$$-9a = 30$$

$$a = \frac{30}{-9}$$

$$\boxed{a = \frac{10}{-3}}$$

10. A telephone pole is anchored to the ground by 2 wires, one on each side. One wire has an angle of elevation of 40°. The other wire is 10 ft longer and has an angle of elevation of 35°. How tall is the pole?



$$\sin 40^\circ = \frac{h}{x} \qquad \sin 35^\circ = \frac{h}{x+10}$$

$$x = \frac{h}{\sin 40^\circ} \qquad x + 10 = \frac{h}{\sin 35^\circ}$$

$$x = \frac{h}{\sin 35^\circ} - 10$$

$$\frac{h}{\sin 40^\circ} = \frac{h}{\sin 35^\circ} - 10$$

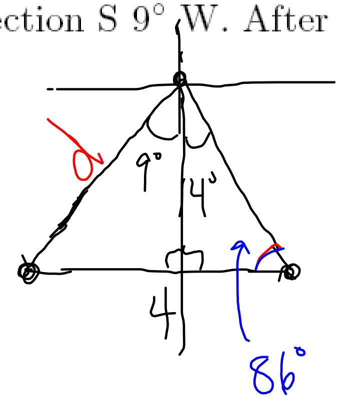
$$\frac{h}{\sin 40^\circ} - \frac{h}{\sin 35^\circ} = -10$$

$$h\left(\frac{1}{\sin 40^\circ} - \frac{1}{\sin 35^\circ}\right) = -10$$

$$h(\csc 40^\circ - \csc 35^\circ) = -10$$

$$\boxed{h = \frac{-10}{\csc 40^\circ - \csc 35^\circ} \approx 53.27 \text{ ft.}}$$

11. Jack and Jill set sail from the same point. Jack travels in the direction S 4° E and Jill travels in the direction S 9° W. After 4 hours, Jill is 4 miles due west of Jack. How far had Jill sailed?

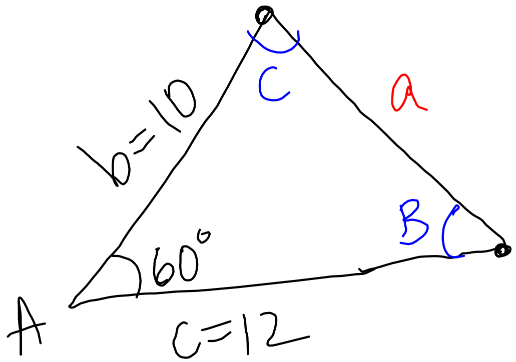


$$\frac{\sin 13^\circ}{4} = \frac{\sin 86^\circ}{d}$$

$$\boxed{d = \frac{4\sin 86^\circ}{\sin 13^\circ} \approx 17.7383\text{ mi}}$$

12. Solve the following triangles.

(a) $A = 60^\circ, b = 10, c = 12$

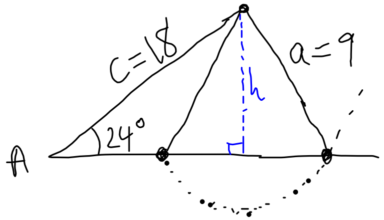


$$a^2 = b^2 + c^2 - 2(b)(c)\cos A$$
$$= 10^2 + 12^2 - 2(10)(12)\cos 60^\circ$$
$$= 100 + 144 - 240\left(\tfrac{1}{2}\right)$$
$$= 244 - 120$$
$$= 124$$
$$a = \sqrt{124} = 2\sqrt{31} \approx 11.1355$$

$$b^2 = a^2 + c^2 - 2ac\cdot\cos B$$
$$10^2 = 11.1355^2 + 12^2 - 2(11.1355)(12)\cos B$$
$$\cos B \approx .6286$$
$$B = \cos^{-1}(0.6286) \approx 51.0518^\circ$$

$$C = 180 - A - B = 68.9482^\circ$$

(b) $A = 24°, a = 9, c = 18$

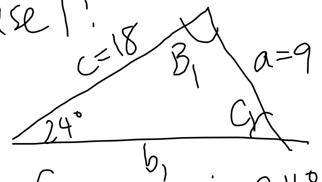


$\sin 24° = \frac{h}{18}$

$18 \sin 24° = h$

$h \approx 7.32 \ldots$

Case 1:



$\frac{\sin C_1}{18} = \frac{\sin 24°}{9}$

$\sin C_1 = \frac{18 \cdot \sin 24°}{9}$

$\sin C_1 = 0.8135$

$C_1 = \sin^{-1}(0.8135) \approx \boxed{54.4367°}$

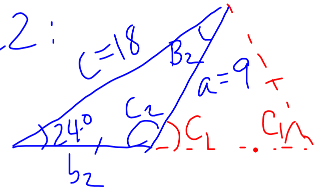
$B_1 = 180 - A - C_1 = \boxed{101.5633°}$

$\frac{\sin B_1}{b_1} = \frac{\sin 24°}{9}$

$b_1 = \frac{9 \cdot \sin 101.5633°}{\sin 24°}$

$\boxed{b_1 = 21.6782}$

Case 2:



$C_2 = 180 - C_1$

$= 180 - 54.4367°$

$\approx \boxed{125.5633°}$

$B_2 = 180 - A - C_2$

$\approx \boxed{30.4367°}$

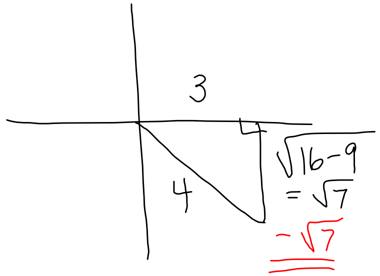
$\frac{\sin 30.4367°}{b_2} = \frac{\sin 24°}{9}$

$b_2 = \frac{9 \cdot \sin 30.4367°}{\sin 24°}$

$\approx \boxed{11.2094}$

13. Suppose that $\sec x = \frac{4}{3}$ and that x is in Quadrant IV.

(a) Find all other trig values of x.



$$\sin x = \frac{-\sqrt{7}}{4} \qquad \csc x = -\frac{4}{\sqrt{7}}$$

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

$$\tan x = -\frac{\sqrt{7}}{3} \qquad \cot x = -\frac{3}{\sqrt{7}}$$

(b) Find all trig values of $2x$.

$$\sin 2x = 2\sin x \cos x = \cancel{2}^{1}\left(-\frac{\sqrt{7}}{\cancel{4}_{2}}\right)\left(\frac{3}{4}\right) = \frac{-3\sqrt{7}}{8}$$

$$\csc 2x = -\frac{8}{3\sqrt{7}}$$

$$\cos 2x = \cos^2 x - \sin^2 x = \left(\frac{3}{4}\right)^2 - \left(\frac{-\sqrt{7}}{4}\right)^2$$

$$= \frac{9}{16} - \frac{7}{16} = \frac{2}{16} = \frac{1}{8}$$

$$\sec 2x = 8$$

$$\tan 2x = \frac{2\tan x}{1-\tan^2 x} = \frac{\sin 2x}{\cos 2x} = \frac{\frac{-3\sqrt{7}}{8}}{\frac{1}{8}} = -3\sqrt{7}$$

$$\cot 2x = \frac{1}{-3\sqrt{7}}$$

14. Verify the following identities:

$$1 + \tan^2 x = \sec^2 x$$

(a) $\dfrac{\dfrac{\sec x}{\tan x} - \dfrac{\tan x}{\sec x}}{\cot x} = \cos x$

$$\frac{\dfrac{\sec x}{\tan x} - \dfrac{\tan x}{\sec x}}{\cot x} = \frac{\dfrac{\sec^2 x - \tan^2 x}{\sec x \tan x}}{\cot x} = \frac{\dfrac{1}{\sec x \cdot \tan x}}{\cot x}$$

$$= \frac{1}{\cot x \sec x \tan x} = \frac{1}{\cancel{\dfrac{\cos x}{\sin x}} \cdot \dfrac{1}{\cancel{\cos x}} \cdot \cancel{\dfrac{\sin x}{\cos x}}} = \frac{1}{\dfrac{1}{\cos x}}$$

$$= \underline{\underline{\cos x}}$$

(b) $\tan\frac{u}{2}\left(\csc\left(\frac{\pi}{2}-u\right)+1\right)=\tan u$

$\tan\frac{u}{2} = \frac{1-\cos u}{\sin u}$

$\csc\left(\frac{\pi}{2}-u\right) = \sec u$

Cofunction Identity

$$\tan\frac{u}{2}\left(\csc\left(\frac{\pi}{2}-u\right)+1\right)$$

$$=\left(\frac{1-\cos u}{\sin u}\right)\left(\sec u+1\right)$$

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

$$=\frac{(1-\cos u)(1+\cos u)}{\sin u\cdot\cos u} = \frac{1-\cos^2 u}{\sin u\cdot\cos u} = \frac{\sin^{\cancel{2}} u}{\cancel{\sin u}\cdot\cos u}$$

$$=\frac{\sin u}{\cos u} = \underline{\underline{\tan u}}. \checkmark$$

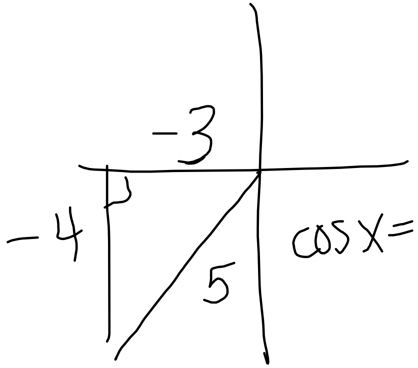
15. Find the exact value of $\sin(x-y)$ given that $\sin x = -\frac{4}{5}$ and $\cos y = \frac{12}{13}$ with x in Quadrant III and y in Quadrant IV.

$$\sin(x-y) = \sin x \cos y - \cos x \sin y$$

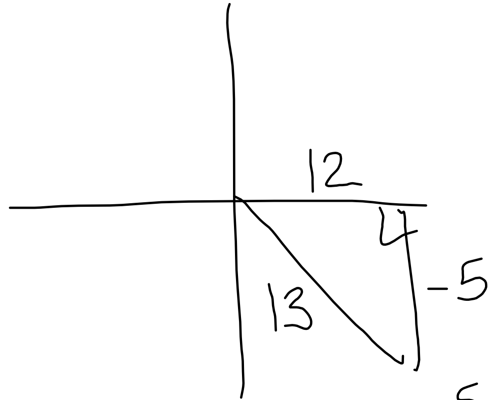
$$= \left(-\frac{4}{5}\right)\left(\frac{12}{13}\right) - \left(\frac{-3}{5}\right)\left(\frac{-5}{13}\right)$$

$$= \frac{-48}{65} - \frac{15}{65}$$

$$= \boxed{-\frac{63}{65}}$$



$\cos x = \frac{-3}{5}$

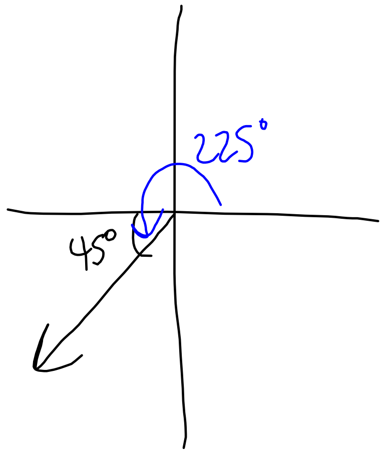


$\sin y = \frac{-5}{13}$

16. Find $\cos(285^\circ)$ by using an Addition or Subtraction Formula.

$285 = 225 + 60$

$$\cos(285^\circ) = \cos(225^\circ + 60^\circ)$$



$$= \cos 225^\circ \cos 60^\circ - \sin 225^\circ \sin 60^\circ$$

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

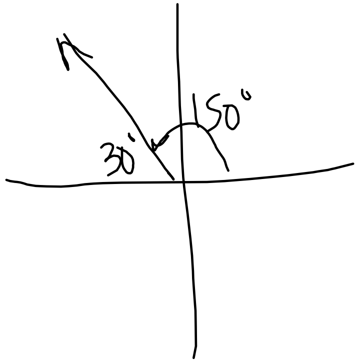
$$= -\frac{1}{2\sqrt{2}} + \frac{\sqrt{3}}{2\sqrt{2}} = \boxed{\frac{-1+\sqrt{3}}{2\sqrt{2}}}$$

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

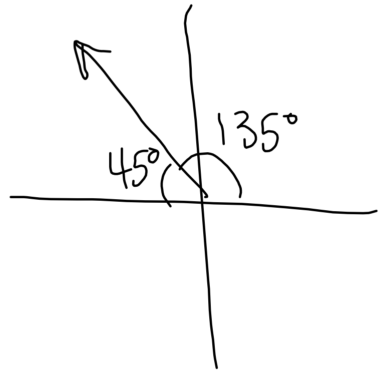
17. Use a Sum-to-Product Formula to evaluate $\sin 285^\circ - \sin 15^\circ$.

$$\sin x - \sin y = 2\cos\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)$$

$$\sin 285^\circ - \sin 15^\circ = 2\cos\left(\frac{285+15}{2}\right)\sin\left(\frac{285-15}{2}\right)$$



$$= 2\cos 150^\circ \sin 135^\circ$$



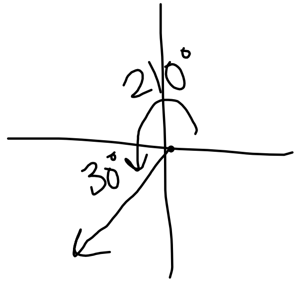
$$= \cancel{2}\left(-\frac{\sqrt{3}}{\cancel{2}}\right)\left(\frac{1}{\sqrt{2}}\right)$$

$$= \boxed{\frac{-\sqrt{3}}{\sqrt{2}} = \frac{-\sqrt{6}}{2}}$$

18. Find the exact value of $\cos 105^\circ$ using a Half-Angle Formula.

$$\cos\frac{x}{2} = \pm\sqrt{\frac{1+\cos x}{2}}$$

105° is in QII, and cosine is < 0 in QII.



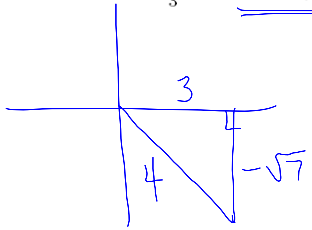
$$\cos 105^\circ = \cos\frac{210^\circ}{2} = -\sqrt{\frac{1+\cos 210^\circ}{2}}$$

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

$$= -\sqrt{\frac{1-\frac{\sqrt{3}}{2}}{2}} = -\sqrt{\frac{2-\sqrt{3}}{4}}$$

$$= \frac{-\sqrt{2-\sqrt{3}}}{2}$$

19. If $\tan x = -\frac{\sqrt{7}}{3}$ and $270^\circ < x < 360^\circ$, find $\sin\frac{x}{2}$, $\cos\frac{x}{2}$, and $\tan\frac{x}{2}$.



$270^\circ < x < 360^\circ$

$135^\circ < \frac{x}{2} < 180^\circ \to$ QII.

$$\sin\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{2}}$$

$$= +\sqrt{\frac{1-\frac{3}{4}}{2}} = \sqrt{\frac{\frac{1}{4}}{2}}$$

$$= \boxed{\sqrt{\frac{1}{8}} = \frac{1}{2\sqrt{2}} = \frac{\sqrt{2}}{4}}$$

$$\cos\frac{x}{2} = \pm\sqrt{\frac{1+\cos x}{2}}$$

$$= -\sqrt{\frac{1+\frac{3}{4}}{2}} = -\sqrt{\frac{\frac{7}{4}}{2}}$$

$$= \boxed{-\sqrt{\frac{7}{8}} = \frac{-\sqrt{7}}{2\sqrt{2}} = \frac{-\sqrt{14}}{4}}$$

$$\tan\frac{x}{2} = \frac{1-\cos x}{\sin x} = \frac{1-\frac{3}{4}}{\frac{-\sqrt{7}}{4}}$$

$$= \frac{\frac{1}{4}}{\frac{-\sqrt{7}}{4}} = \boxed{-\frac{1}{\sqrt{7}}} = \frac{-\sqrt{7}}{7}$$

20. The wheel from "Wheel of Fortune" is spun while you are sitting on the edge. Suppose the wheel has a radius of 5 ft and is spinning at a rate of 20 rpm.

(a) What is the angular speed of the wheel?

20 rpm = 20 revolutions per minute

$\omega = 20 \times 2\pi = \boxed{40\pi \text{ rad/min}}$

(b) At what speed will you fly off the wheel if it stops suddenly?

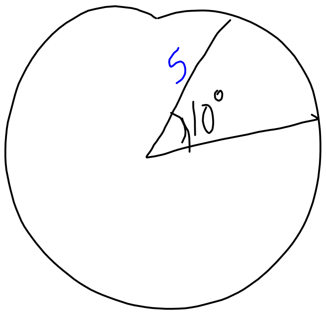
$v = r \cdot \omega = (5)(40\pi) = \boxed{200\pi \text{ ft/min}}$

OR

1 revolution $= 2\pi r = 10\pi$ ft

$20 \times 10\pi = \boxed{200\pi \text{ ft/min}}$

(c) If one piece on the wheel subtends an angle of 10°, what is the area of this piece?



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

θ must be in radians

$\theta = 10^\circ \times \frac{\pi}{180^\circ} = \frac{\pi}{18}$

$A = \frac{1}{2}(5)^2\left(\frac{\pi}{18}\right)$

$\boxed{A = \frac{25\pi}{36} \text{ ft}^2}$