(4)

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

$3u^3 - 3u^2 - u + 1 = 0$

$3u^2[u-1] - 1[u-1] = 0$

$(\sqrt{3}u)^2 - 1^2$

$[u-1](3u^2 - 1) = 0$

$(u-1)(\sqrt{3}u - 1)(\sqrt{3}u + 1) = 0$

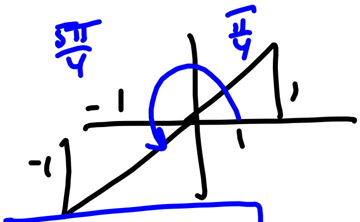
$u - 1 = 0$ OR $\boxed{3u^2 - 1 = 0}$

$u = 1$ $\quad 3u^2 = 1$

$\tan u = 1$

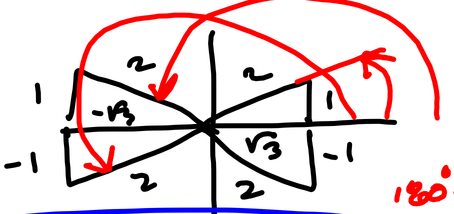
$u^2 = \frac{1}{3}$

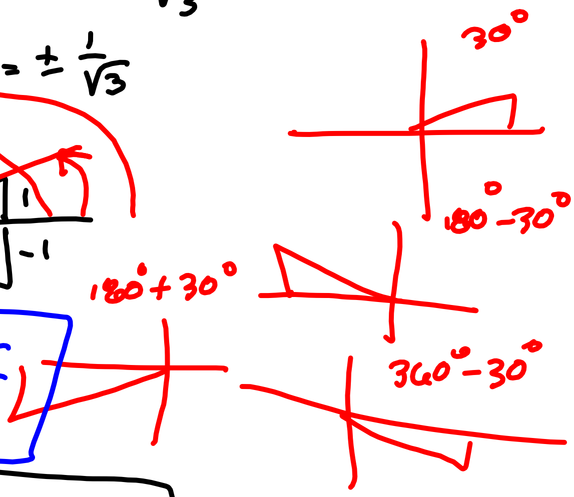
$u = \pm\sqrt{\frac{1}{3}} = \pm\frac{1}{\sqrt{3}}$



$\tan x = \pm\frac{1}{\sqrt{3}}$

$\boxed{\frac{\pi}{4}, \frac{5\pi}{4}}$





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

$\boxed{x \in \left\{\frac{\pi}{6}, \frac{\pi}{4}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{5\pi}{4}, \frac{11\pi}{6}\right\}}$

(b) All solns

$\frac{\pi}{6} + 2n\pi$

$\frac{\pi}{4} + 2n\pi$

$\frac{5\pi}{6} + 2n\pi$

$\frac{7\pi}{6} + 2n\pi$

$\frac{5\pi}{4} + 2n\pi$

$\frac{11\pi}{6} + 2n\pi$

$\frac{\pi}{6} + n\pi$

$\frac{\pi}{4} + n\pi$

$\frac{5\pi}{6} + n\pi$

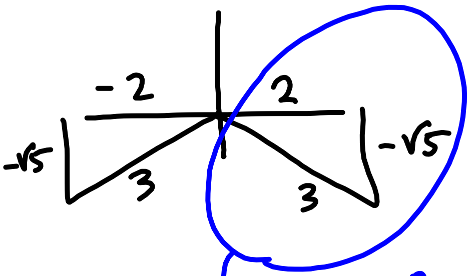
$\forall n \in \mathbb{Z}$

$\{\frac{\pi}{6} + n\pi, \frac{\pi}{4} + n\pi, \frac{5\pi}{6} + n\pi \mid n \in \mathbb{Z}\}$

$\{x + n\pi \mid x = \frac{\pi}{6}, \frac{\pi}{4}, \frac{5\pi}{6}, n \in \mathbb{Z}\}$

$\{x + n\pi \mid x \in \{\frac{\pi}{6}, \frac{\pi}{4}, \frac{5\pi}{6}\}, n \in \mathbb{Z}\}$

(3) $\sin(u) = -\frac{\sqrt{5}}{3}$ and $\tan(u) < 0$



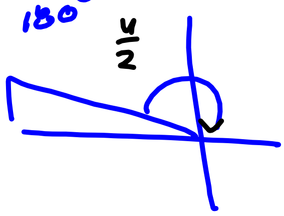
$\sqrt{3^2 - (-\sqrt{5})^2}$

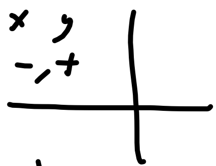
$\sqrt{9-5} = \sqrt{4} = 2$

so $270^\circ < u < 360^\circ$ $\qquad \frac{3\pi}{2} < u < 2\pi$

$135^\circ < \frac{u}{2} < 180^\circ$ $\qquad \frac{3\pi}{4} < \frac{u}{2} < \pi$

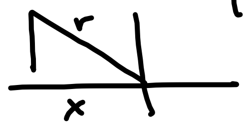
Q II





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

$= \sqrt{\frac{1-\frac{2}{3}}{2}} = \sqrt{\frac{\frac{1}{3}}{2}} = \sqrt{\frac{1}{6}} = \frac{1}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$



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

$1 - \frac{2}{3} = \frac{1}{1} \cdot \frac{3}{3} - \frac{2}{3} = \frac{3-2}{3} = \frac{1}{3}$

$\frac{\frac{1}{3}}{2} = \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6}$

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

$= -\sqrt{\frac{1+\left(\frac{2}{3}\right)}{2}} = \sqrt{\frac{\frac{5}{3}}{2}} = -\sqrt{\frac{5}{6}} = -\frac{\sqrt{5}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$

$= \boxed{-\frac{\sqrt{30}}{6} = \cos\left(\frac{u}{2}\right)}$

$\tan\left(\frac{u}{2}\right) = \frac{\sqrt{6}}{6} \cdot \left(-\frac{6}{\sqrt{30}}\right) = -\frac{\sqrt{6}}{\sqrt{30}} = -\sqrt{\frac{6}{30}} = -\sqrt{\frac{1}{5}}$

$= \boxed{-\frac{\sqrt{5}}{5} = \tan\left(\frac{u}{2}\right)}$

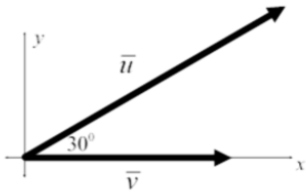
Test 3 Spring '17

4. Forces with magnitudes $\|\bar{u}\| = 90$ **N** and $\|\bar{v}\| = 60$ **N** are acting on a hook, as shown in the figure.

   a. (5 pts) Express $\bar{u}$ and $\bar{v}$ in component form.

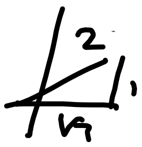
   b. (5 pts) Express the resultant force, in component form.

   c. (5 pts) Find the direction angle of the resultant force, in degrees, rounded to 4 decimal places.



~~5. Let $f(x) = 5x^3 - 23x^2 + 77x - 39$~~

(a)



$\bar{u} = 90\langle \cos 30^\circ, \sin 30^\circ \rangle$

$= 90\left\langle \frac{\sqrt{3}}{2}, \frac{1}{2} \right\rangle$

$= \boxed{\langle 45\sqrt{3}, 45 \rangle = \bar{u}}$

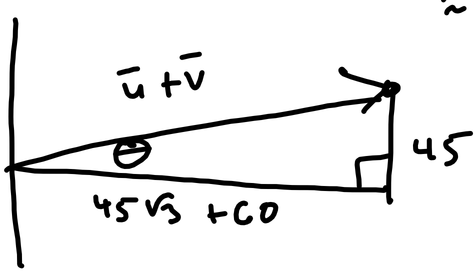
$\boxed{\bar{v} = \langle 60, 0 \rangle}$

(b) $\bar{u} + \bar{v} = \langle 45\sqrt{3}, 45 \rangle + \langle 60, 0 \rangle$

$= \boxed{\langle 45\sqrt{3} + 60, 45 \rangle = \bar{u} + \bar{v}}$

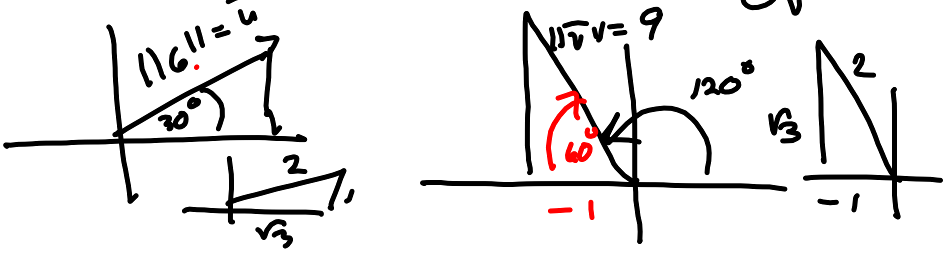
(c) $\theta = \arctan\left(\frac{45}{45\sqrt{3} + 60}\right) \approx 18.06753728^\circ$

$\approx \boxed{18.0675^\circ}$



From the Test 3 sitting in Chapter 4 videos.

$\|\bar{u}\| = 6$, $\theta_{\bar{u}} = 30°$; $\|\bar{v}\| = 9$, $\theta_{\bar{v}} = 120°$

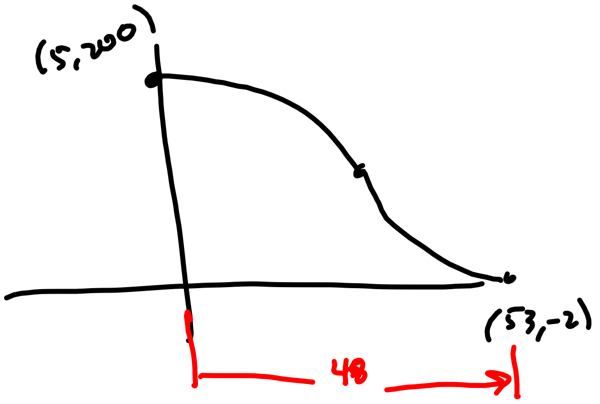


$\bar{u} = 6 \langle \cos 30°, \sin 30° \rangle$

$= \langle \frac{6\sqrt{3}}{2}, \frac{6}{2} \rangle = \boxed{\langle 3\sqrt{3}, 3 \rangle = \bar{u}}$

$\bar{v} = 9 \langle \cos 120°, \sin 120° \rangle$

$= \boxed{\langle -\frac{9}{2}, \frac{9\sqrt{3}}{2} \rangle = \bar{v}}$



$\frac{1}{2}$-period

1 period: $T = 96$

$\cos(bx\ )$

want

$bx = 2\pi$ when

$x = 96$

$96b = 2\pi$

$b = \frac{2\pi}{96} = \frac{\pi}{48}$