Solutions to Sample Problems for Exam 2

1. See solutions to sample problems for Exam 1.

2. (Will not be on Exam). Use long division

(i) $3x+2 \overline{)\,3x^2-5x+1}$

$x-7/3$

$-3x^2 \pm 2x$

$-7x+1$

$-7x-14/3$

$-11/3$

$$\frac{3x^2-5x+1}{3x+2} = x-7/3 - \frac{11/3}{3x+2}$$

slant asymptote is $y = x-7/3$

(ii) $x^2+4x-1 \overline{)\,2x^3+7}$

$2x-6$

$\pm 2x^3 \pm 6x^2$

$-6x^2+7$

$\mp 6x^2 \mp 24x \pm 6$

$24x+1$

$$\frac{2x^3+7}{x^2+4x-1} = 2x-6 + \frac{24x+1}{x^2+4x-1}$$

slant asymptote is $y = 2x-6$.

3. See classwork or notes or book.

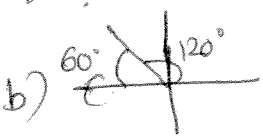
4. a) 

ref angle $\bar{\theta} = \pi/3$.

Quad = 4th.

$\sin(-\pi/3) = -\sin \pi/3$

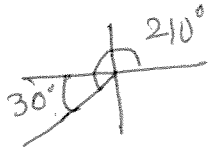
$= -\sqrt{3}/2$

b) 

ref angle $\bar{\theta} = 60°$

Quad = 2nd

$\cos 120° = -\cos 60° = -1/2$

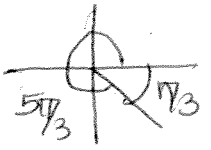
c) 

ref angle $= \bar{\theta} = 30°$

Quad = 3rd

~~tan~~

$\tan 210° = \tan 30° = 1/\sqrt{3}$

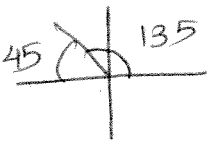
d) 

ref angle $= \bar{\theta} = \pi/3$

Quad = 4th

$\sec 5\pi/3 = \frac{1}{\cos 5\pi/3} = \frac{1}{\cos \pi/3}$

$= \frac{1}{1/2} = 2$

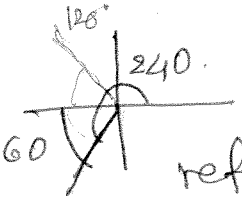
4. e) 

ref angle $= \bar{\theta} = 45$

Quad $= 2^{nd}$

$\csc 135^\circ = \frac{1}{\sin 135^\circ} = \frac{1}{\sin 45}$

$= \frac{1}{\sqrt{2}/2} = \frac{2}{\sqrt{2}} = \sqrt{2}$

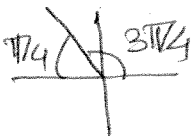
f) 

ref angle $= \bar{\theta} = 60$

Quad $= 3^{rd}$

$\cot 240^\circ = \frac{1}{\tan 240^\circ}$

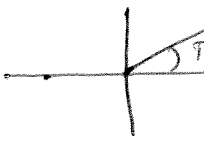
$= \frac{1}{\tan 60^\circ} = \frac{1}{\sqrt{3}}$

g) 

ref angle $= \bar{\theta} = \pi/4$.

Quad $= 2^{nd}$

$\cos\left(\frac{3\pi}{4}\right) = -\cos \pi/4 = -\frac{\sqrt{2}}{2}$

h) 

$\frac{13\pi}{6} = 2\pi + \frac{\pi}{6}$.

$\sin\left(\frac{13\pi}{6}\right) = \sin(\pi/6) = 1/2$.

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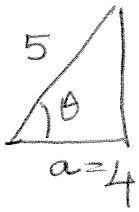
5. a) 

$\sin\theta = \frac{opp}{hyp} = \frac{3}{5}$.

$a^2 + 3^2 = 5^2$

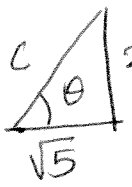
$a^2 + 9 = 25$

$a^2 = 16$

$a = 4$ (as side of triangle)

$\cos\theta = \frac{4}{5}$, $\tan\theta = 3/4$, $\cot\theta = 4/3$

$\sec\theta = 5/4$, $\csc\theta = 5/3$.

b) 

$\tan\theta = \frac{opp}{adj} = \frac{2}{\sqrt{5}}$

$2^2 + \sqrt{5}^2 = c^2$

$4 + 5 = c^2$

$9 = c^2$, $c = 3$

(as side of triangle)

$\sin\theta = \frac{2}{3}$, $\cos\theta = \frac{\sqrt{5}}{3}$ $\cot\theta = \frac{\sqrt{5}}{2}$

$\csc\theta = \frac{3}{2}$, $\sec\theta = \frac{3}{\sqrt{5}}$

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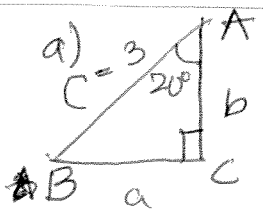
6. a) 

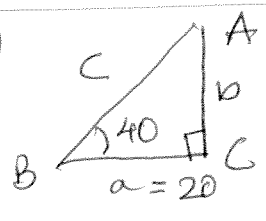
$B = 70^\circ$.

$\sin 20^\circ = \sin A = \frac{a}{c}$

$a = 3\sin 20^\circ = \underline{1.03}$

$\cos 20^\circ = \cos A = \frac{b}{c}$

$b = 3\cos 20 = \underline{2.82}$.

b) 

$A = 90^\circ - 40^\circ = 50^\circ$

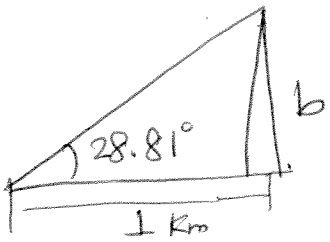
$\tan B = \frac{b}{a}$

$b = 20\tan 40$

$= \underline{16.78}$

$\cos B = \frac{a}{c}$

$c = \frac{20}{\cos 40} = \underline{26.11}$

7. 

$\tan 28.81 = b/a$

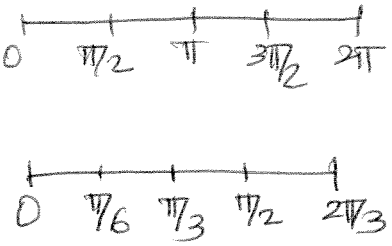
$b = 1 \times \tan 28.81 = 0.55$ Km.

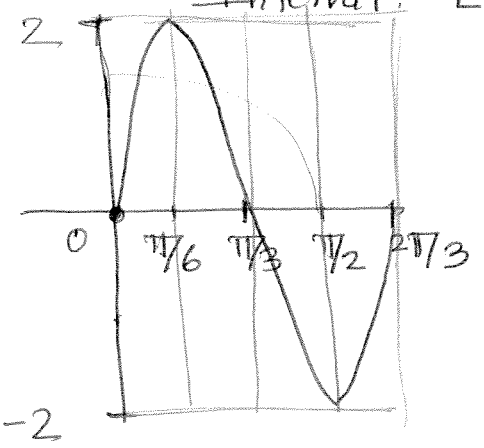
8. Wrong Problem. Please Ignore.

9. a) $y = 2\sin 3t$ amp $= |2| = 2$, $K = 3$, period $= \frac{2\pi}{3}$, freq $= \frac{3}{2\pi}$

phase shift $= 0$.

Interval: $[b, b + \frac{2\pi}{K}] = [0, \frac{2\pi}{3}]$ divide by $K=3$

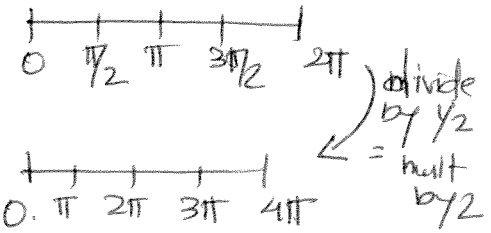


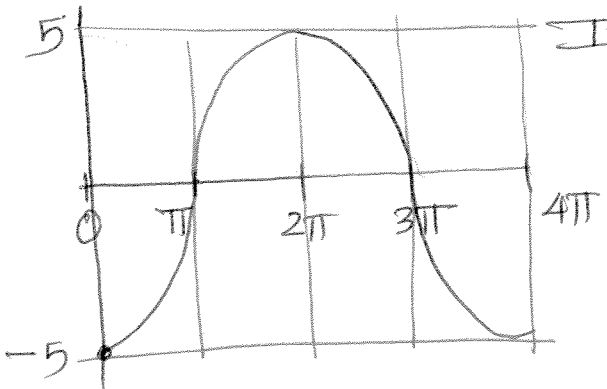


b) $y = -5\cos(t/2)$, amp $= |-5| = 5$, $K = \frac{1}{2}$, period $= \frac{2\pi}{1/2} = 4\pi$, freq $= \frac{1}{4\pi}$

phase shift $= 0$.

Interval $= [0, 4\pi]$



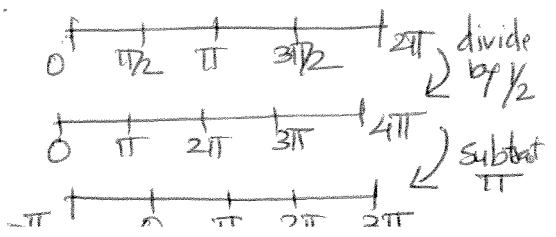


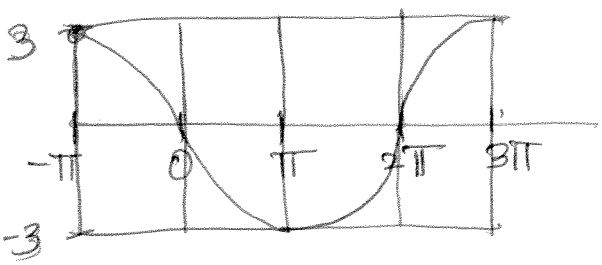
c) $y = 3\cos(\frac{1}{2}t + \pi/2) = 3\cos\frac{1}{2}(t + \pi)$, $K = 1/2$, $b = -\pi$

amp $= 3$, period $= \frac{2\pi}{1/2} = 4\pi$, freq $= 1/4\pi$

phase shift $= -\pi$.

$[-\pi, 3\pi]$





10. : 8 cycles per second = frequency $= K/2\pi$

So $\frac{K}{2\pi} = 8$, $K = 16\pi$ (rad/s = angular speed).

amp = 50 cm.

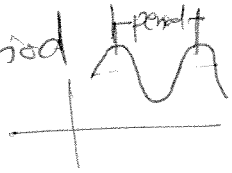
$t=0$ max displ $\Rightarrow a = 50$.

$y = 50\cos(16\pi t)$.

11. $y = 900\cos 2t + 8000$

a) max pop at $t=0$, $900 + 8000 = \underline{8900}$

b) time between successive max pop = period



$K = 2$, period $= \frac{2\pi}{K} = \frac{2\pi}{2} = \underline{\pi \text{ years}}$.

12. $d = 14$ in. $\Rightarrow r = \frac{d}{2} = 7$ in.

linear speed = $v = 55$ mi/h.

$v = r\omega \Rightarrow \omega = \frac{v}{r} = \frac{55}{7} = 7.86$ rad/hr.

13. a) angular speed = $\omega = \frac{\theta}{t} = \frac{2\pi}{24} = \frac{\pi}{12}$ rad/hr.

$v = r\omega = 3960 \times \frac{\pi}{12} = \underline{1036.73 \text{ mi/hr}}$.

b) $\omega = 600$ rpm $= 600 \times 2\pi$ rad/minute, $r = 11$ in.

$V = r\omega = 611 \times 600 \times 2\pi$ inc/min $= 41469$ in/min.

1 in/min $= \frac{60}{63360}$ mi/hr. $V = \frac{41469 \times 60}{63360}$ mi/hr

$= \underline{39.27 \text{ mi/hr}}$.

c) $d = 48$ in, $r = d/2 = 24$ in

$V = 50$ mi/hr, $v = r\omega$, $\omega = \frac{V}{r} = \frac{50}{24}$ rad/hr $= \underline{2.08 \text{ rad/hr}}$

1 rad/hr $= \frac{1}{60}$ rad/min $= \frac{2.08}{60}$ rad/min ≈ 0.03 rad/min