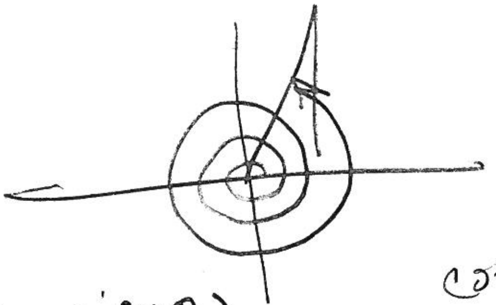
122 E1

FALL, 2017

(1) $\frac{19\pi}{3} = \frac{18\pi}{3} + \frac{\pi}{3} = 6\pi + \frac{\pi}{3}$



coterminals

$\boxed{\frac{\pi}{3},\ -\frac{5\pi}{3} \quad 60^\circ,\ -300^\circ}$

10pts

$\left(\frac{19\pi}{3}\right)\left(\frac{180}{\pi}\right)$

$= 1140^\circ = 3(360)^\circ + 60^\circ \rightsquigarrow 60^\circ$

(2) $r = 5,\ s = 20$, how many revolutions ?

$s = r\theta \implies \theta = \frac{s}{r} = \left(\frac{20\text{ ft}}{5\text{ in}}\right)\left(\frac{12\text{ in}}{1\text{ ft}}\right) = \frac{240}{5}$

$= \left(48 \text{ radians}\right)\left(\frac{1 \text{ revolution}}{2\pi \text{ radians}}\right) \approx 7.639437268$

$\boxed{\approx 7.6 \text{ revolutions}}$

5pts

(3) $A = \frac{1}{2}r^2\theta = \frac{1}{2}(20)^2\left(\frac{5\pi}{3}\right) = \frac{400(5\pi)}{2(3)}$

$= \boxed{\frac{1000\pi}{3} \text{ cm}^2}$

5pts

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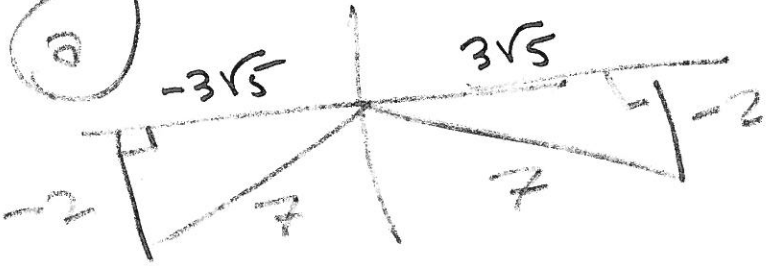
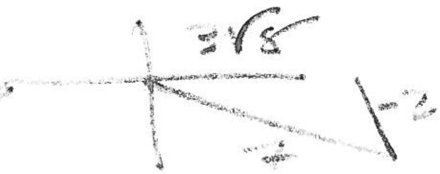
4. $\sin\theta = -\frac{2}{7}$

(a)



5 pts

(b) $\cos\theta > 0 \Longrightarrow$



5 pts

$49 - 4 = 45$

$\sqrt{45} = 3\sqrt{5}$

$\sin\theta = -\frac{2}{7}$

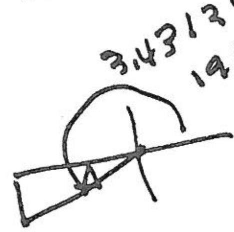
$\cos\theta = \frac{3\sqrt{5}}{7}$

$\tan\theta = \frac{-2}{3\sqrt{5}}$ (or $-\frac{2\sqrt{5}}{15}$)

$\csc\theta = -\frac{7}{2}$

$\sec\theta = \frac{7}{3\sqrt{5}}$ (or $\frac{7\sqrt{5}}{15}$)

$\cot\theta = -\frac{3\sqrt{5}}{2}$



(c) $0 \le \theta < 2\pi$, so Q IV

5 pts

$\arcsin\left(-\frac{2}{7}\right) \approx -.2897517014$ radians

$\approx -16.6015496^\circ$

$360^\circ - 16.6015496 = 343.3984504^\circ$

$2\pi - .2897517014$

≈ 5.993433606

343.398°, 5.993 rad

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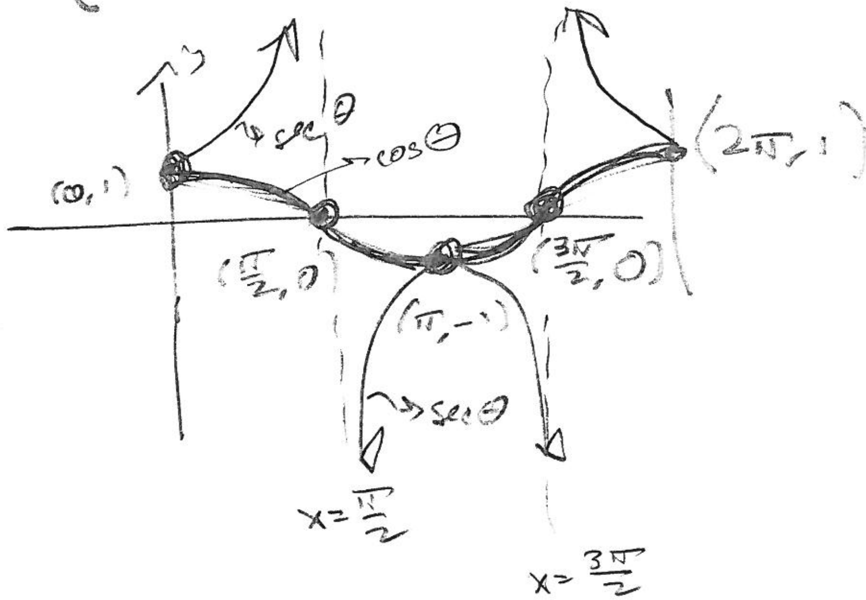
4d 5pts

$\{343.398^\circ + 360^\circ n \mid n \in \mathbb{Z}\}$

$\{5.993 + 2\pi \mid n \in \mathbb{Z}\}$

5 10pts



6 10pts

$$\left(\frac{1.9 \text{ revs front sprocket}}{\text{sec}}\right)\left(\frac{\text{revs back sprocket}}{3 \text{ revs front sprocket}}\right)\left(\frac{2\pi \text{ radians}}{1 \text{ rev back sprocket}}\right) \cdot$$

$$\cdot \left(14\text{-inch radius}\right)\left(\frac{1 \text{ ft}}{12 \text{ in}}\right) = \frac{(1.9)(14)\pi}{3} \frac{\text{ft}}{\text{s}}$$

$$= 8.8\overline{6}\pi \frac{\text{ft}}{\text{s}} = \frac{133}{15}\pi \frac{\text{ft}}{\text{s}} \approx \boxed{27.85545486 \frac{\text{ft}}{\text{s}}}$$

$$\cdot \left(\frac{60 \text{ mi/hr}}{88 \text{ ft/s}}\right) \approx \boxed{18.99235559 \frac{\text{mi}}{\text{hr}}}$$

$$\boxed{27.9 \frac{\text{ft}}{\text{s}}} \qquad \boxed{19.0 \frac{\text{mi}}{\text{hr}}}$$

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7 10pts

$A=10 \qquad y=-25$

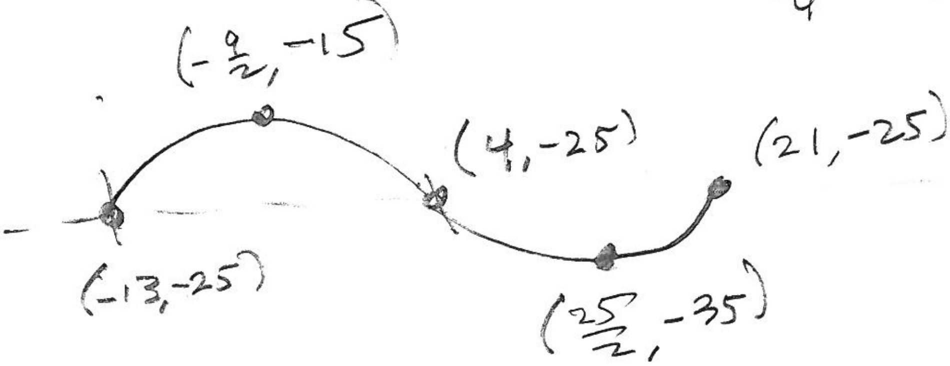
$$f(x) = 10\sin\left(\frac{\pi}{17}(x+13)\right) - 25$$

$x=-13$

$$\frac{\pi}{17}x = 2\pi \longrightarrow x = 34 = T$$

$A=10$

$$\frac{34}{4} = \frac{17}{2}$$



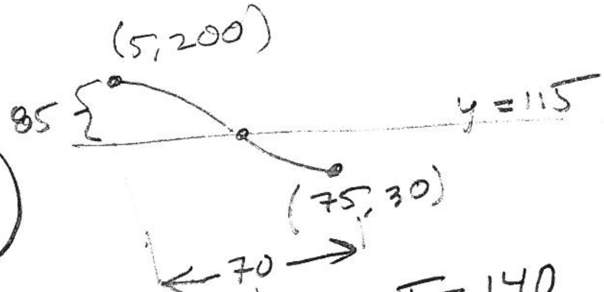
$y=-25$

$$-13 + \frac{17}{2}$$
$$= \frac{-26+17}{2} = -\frac{9}{2}$$
$$-\frac{9}{2} + \frac{17}{2} = \frac{8}{2} = 4$$
$$\frac{8+17}{2} = \frac{25}{2}$$

$$\frac{25}{2} + \frac{17}{2} = \frac{42}{2} = 21$$
$$-13 + 34 = 21 ✓$$

$$\boxed{y = 85\cos\left(\frac{\pi}{70}(x-5)\right) + 115}$$

8 10pts



so, $T = 140$

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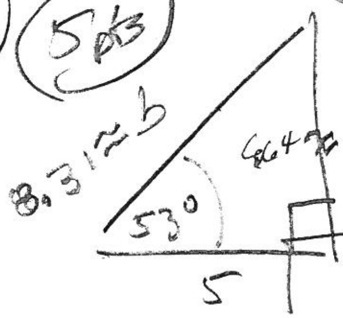
9 5 pts

$C = 37^\circ$



$C = 180^\circ - 90^\circ - 53^\circ$

$\boxed{C = 37^\circ}$

$\boxed{B = 90^\circ}$

$\frac{a}{5} = \tan 53^\circ$

$a = 5 \tan 53^\circ$

≈ 6.635224108

$\approx \boxed{6.64 \approx a}$

$\frac{5}{b} = \cos 53^\circ$

$\frac{5}{\cos 53^\circ} = b \approx 8.308200706$

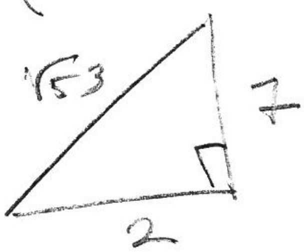
$\approx \boxed{8.31 \approx b}$

10 a 5 pts

$\cos\left(\arctan\left(\frac{7}{2}\right)\right) = \boxed{\frac{2}{\sqrt{53}}}$ $\left(\text{OR } \frac{2\sqrt{53}}{53}\right)$

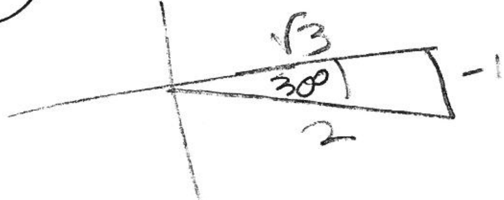
$49 + 4 = 53$

$\Rightarrow \sqrt{53}$



b 5 pts $\arccos\left(\cos\left(\frac{11\pi}{6}\right)\right) = \arccos\left(\frac{\sqrt{3}}{2}\right)$

$= \frac{\pi}{6}$ OR 30°



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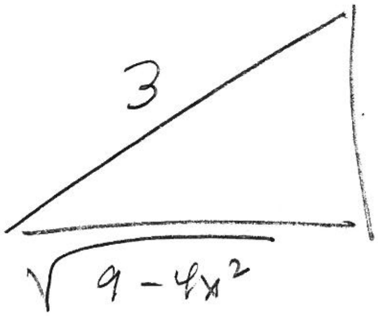
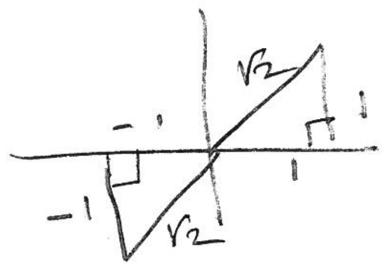
(11) (5pts) $\cos\left(\arctan\left(\frac{2x}{\sqrt{9-4x^2}}\right)\right)$



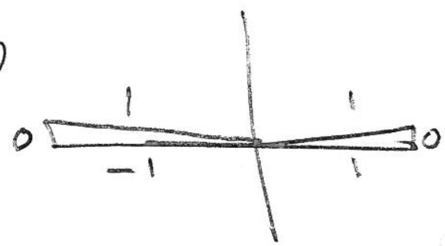
$\boxed{= \frac{\sqrt{9-4x^2}}{3}}$

(B1) (5pts) (12)

(a) $\tan x = 1$

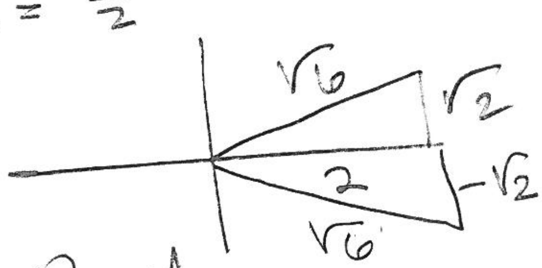


(b) $\sin x = 0$



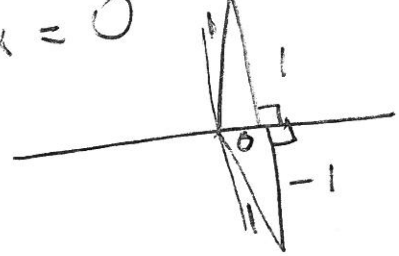
(c) $\sin x = \frac{\sqrt{6}}{2} > 1$ impossible

(d) $\sec x = \frac{\sqrt{6}}{2} \Longrightarrow \cos x = \frac{2}{\sqrt{6}}$



$\sqrt{6}^2 - 2^2$
$= 6-4=2$
$\Longrightarrow \sqrt{2}$

(e) $\cos x = 0$



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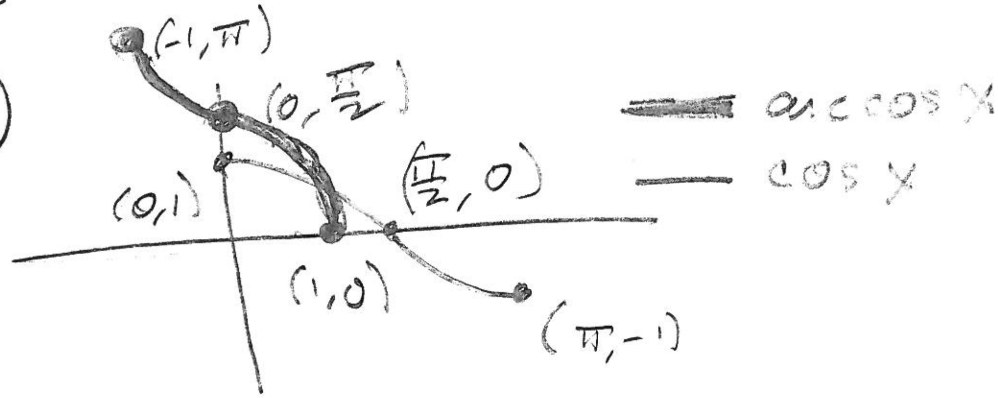
B2 5pts 13



B3 14 5pts

Circumference of circle is $2\pi r$

θ for one full rev. is 2π,

so $2\pi r = \theta r$, i.e.

$$s = r\theta$$

Area of a circle is πr^2

θ is 2π so

$$\pi r^2 = \frac{1}{2}(2\pi)r^2 = \frac{1}{2}\theta r^2, \text{ i.e.}$$

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