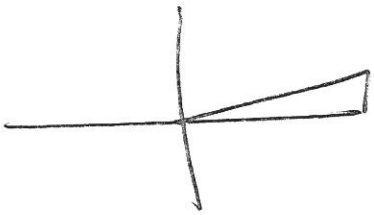
122 TEST 1 Spring, 2018

(1) $\frac{33\pi}{8} = \frac{32\pi}{8} + \frac{1\pi}{8} = 4\pi + \frac{\pi}{8}$



So, coterminal with

$\frac{\pi}{8}, -\frac{15\pi}{8}$

10 pts

$\left(\frac{\pi}{8}\right)\left(\frac{180}{\pi}\right)$

$= \frac{40}{4} = \frac{45}{2} = 22.5^\circ$

$-360 + 22.5^\circ = 337.5^\circ$, so

$22.5^\circ$
$-337.5^\circ$

(2) $r = 8''$, $s = 50$ ft

$s = r\theta$

$50 \text{ ft} = (8'')\left(\frac{1 \text{ ft}}{12''}\right)\theta = \frac{2}{3}\theta$ ft

$\frac{50}{\frac{2}{3}} = \frac{3(50)}{2} = 3(25) =$ 75 radians $\Rightarrow$ 11.9 revs (about)

11.93662073

5 pts

& $(75 \text{ radians})\left(\frac{1 \text{ rev}}{2\pi \text{ radians}}\right) \approx 11.9366$ revs

(3) $A = \frac{1}{2}r^2\theta = \frac{1}{2}(40)^2\left(\frac{3\pi}{8}\right) = \frac{1}{2}(40)(40)\left(\frac{3\pi}{8}\right)$

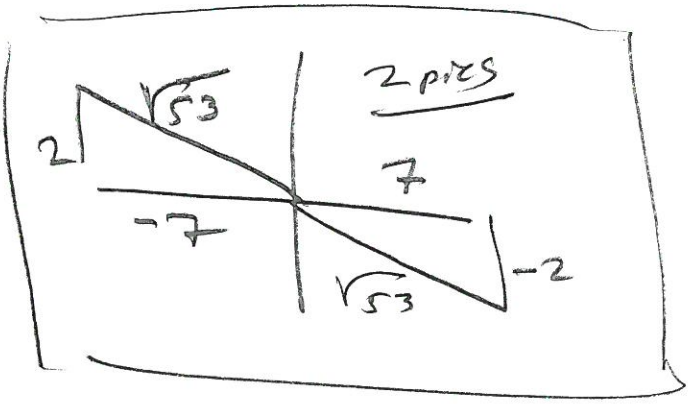
$= (20)(5)(3\pi) =$ $300\pi$ cm$^2$

5 pts

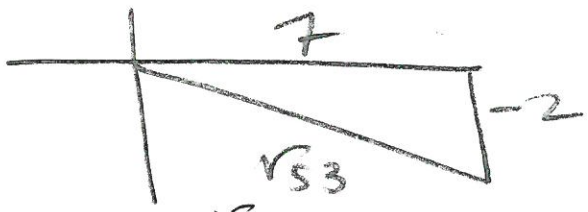
(4) (a) (5 pts) $\tan\theta = -\frac{2}{7}$

$\sqrt{2^2+7^2} = \sqrt{4+49}$

$= \sqrt{53}$




(b) (5 pts) $\cos\theta > 0$ ⟹




$\sin\theta = -\frac{2}{\sqrt{53}}$ $\quad \csc\theta = -\frac{\sqrt{53}}{2}$

$\cos\theta = \frac{7}{\sqrt{53}}$ $\quad \sec\theta = \frac{\sqrt{53}}{7}$

$\tan\theta = -\frac{2}{7}$ $\quad \cot\theta = -\frac{7}{2}$

(c) (5 pts) $0 \le \theta < 2\pi$. Find $\theta$

$\tan^{-1}(-\frac{2}{7}) \approx -15.945\,3959^\circ$

So coterminal $\in [0, 360^\circ)$ in

$360^\circ - 15.94\ldots \approx 344.0546041$

$\theta \approx 344.055^\circ$

$\approx 6.004885648$

$\theta \approx 6.005$ radians

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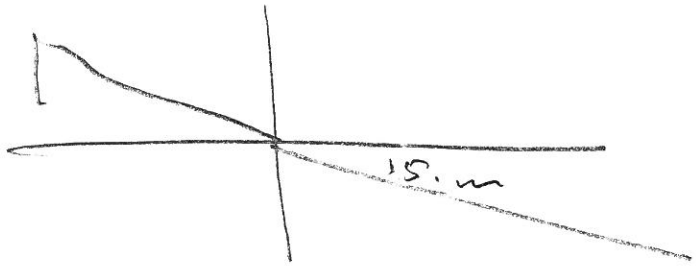
4 d (5pts) ALL solns!?




Short Answers

$\theta \approx 344.055^\circ + 180^\circ n, \; n \in \mathbb{Z}$

OR $6.005 + \pi n, \; n \in \mathbb{Z}$

Longer: $180^\circ - 15.945\,39\,59$

$\approx 164.054\,6041^\circ$

or $2.863\,292\,995$ radians, so

Long Answer:

$\theta \approx 344.055^\circ + 360^\circ n, \; 164.055^\circ + 360^\circ n, \; \forall n \in \mathbb{Z}.$

$\theta \approx 6.005 + 2\pi n, \; 2.863 + 2\pi n, \; \forall n \in \mathbb{Z}$

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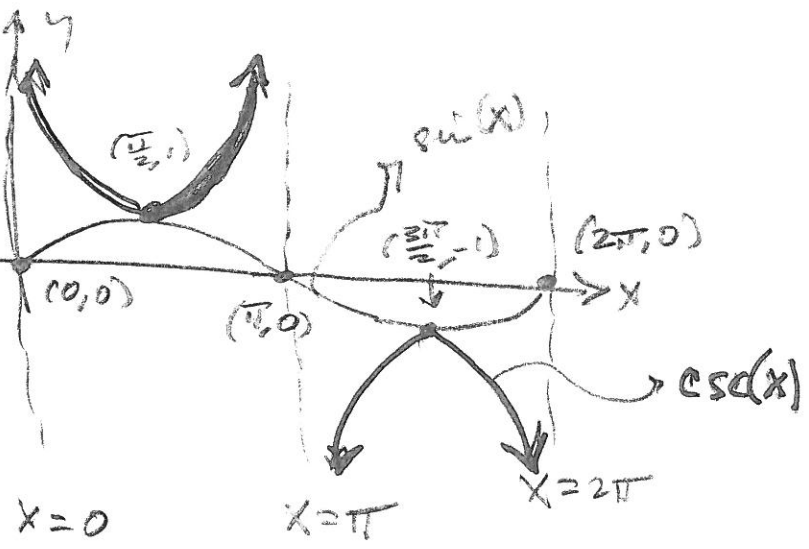
(5) 10 pts




(6) 10 pts $\left(\frac{1.5 \text{ revs front}}{\text{sec}}\right)\left(\frac{5 \text{ revs back}}{3 \text{ revs front}}\right)$.

$\left(16 \text{ inches}\right)\left(\frac{2\pi \text{ radians}}{1 \text{ rev back}}\right)\left(\frac{1 \text{ ft}}{12 \text{ in}}\right)$

$= \frac{20}{3}\pi \frac{\text{ft}}{\text{s}} \approx \boxed{20.94395102 \text{ ft/sec}}$ $\approx 20.9 \frac{\text{ft}}{\text{s}}$ to 1 decimal place.

$\left(20.94395102 \frac{\text{ft}}{\text{s}}\right)\left(\frac{60 \text{ s}}{1 \text{ min}}\right)\left(\frac{\text{mi}}{5280 \text{ ft}}\right)\left(\frac{60 \text{ min}}{1 \text{ hr}}\right)$

$\approx 14.27996666$

$\approx \boxed{14.3 \frac{\text{mi}}{\text{hr}}}$

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(7) 10 pts

$f(x) = 30\sin\left(\frac{\pi}{11}x - \frac{12\pi}{11}\right) + 50$

$= 30\sin\left(\frac{\pi}{11}(x-12)\right) + 50$

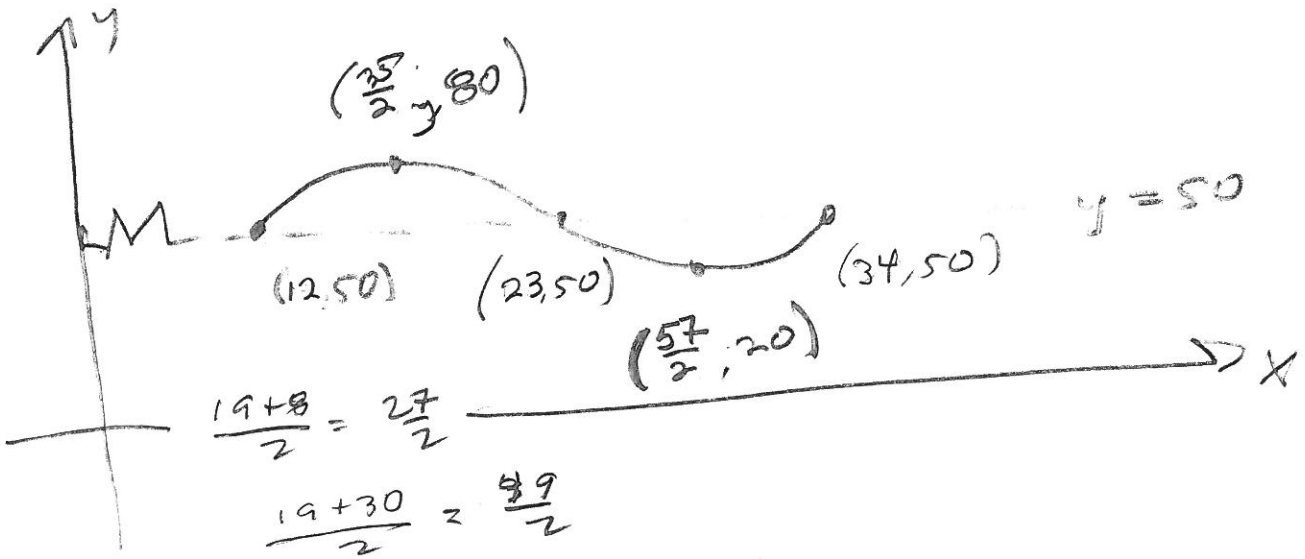
$\frac{\pi}{11}x = 2\pi$

$x = 22 =$ period

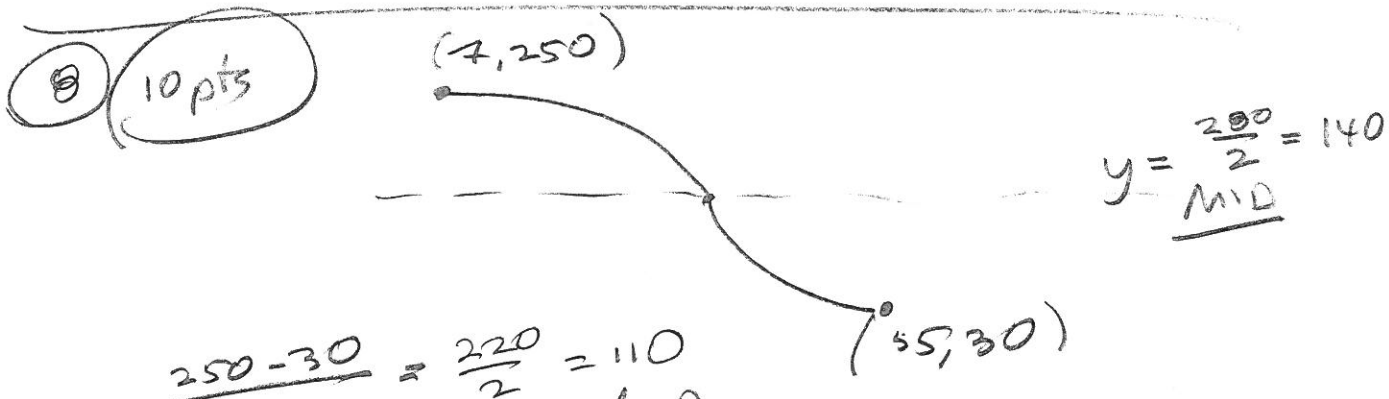
start @ $x = 12$

$y = 50$ midline

Amp = 30




(8) 10 pts




$\frac{250-30}{2} = \frac{220}{2} = 110$ = Amp

$T = 2(55-7)$

$= 2(48) = 96$

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

$y = 110\cos\left(\frac{\pi}{48}(x-7)\right) + 140$

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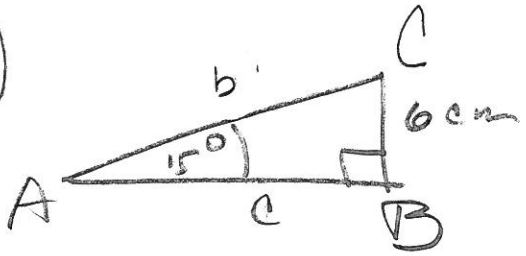
(9)



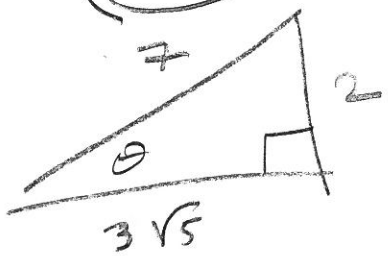

$C = 90° - 15° = 75° = C$

$\frac{6}{c} = \tan 15° \longrightarrow c = \frac{6}{\tan 15°} \approx 22.3923 \text{ cm} \approx C$

$\frac{6}{b} = \sin 15° \longrightarrow b = \frac{6}{\sin 15°} \approx 23.1822 \text{ cm} \approx b$

5 pts

(10) (a) 5 pts $\cot\left(\arcsin\left(\frac{2}{7}\right)\right) = \cot\theta = \frac{3\sqrt{5}}{2}$

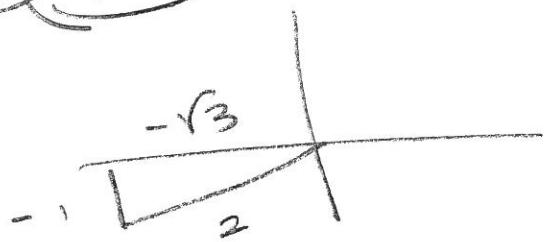



$7^2 - 2^2 = 49 - 4 = 45$

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

(b) 5 pts $\arcsin\left(\sin\left(\frac{7\pi}{6}\right)\right) = \text{Arcsin}\left(-\frac{1}{2}\right)$

$= -\frac{\pi}{6}$ OR $-30°$



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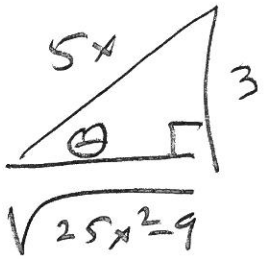
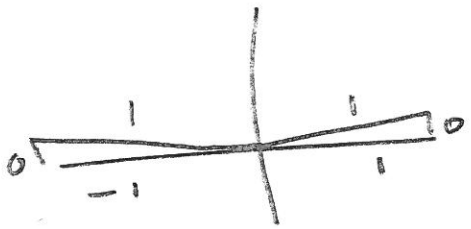
(11) 5pts $\tan(\arcsin(\frac{3}{5x})) = \tan\theta$

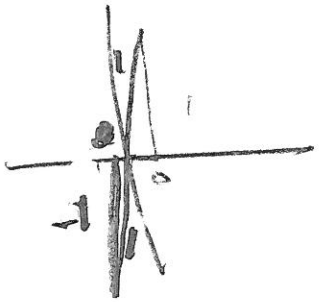



$= \frac{3}{\sqrt{25x^2-9}}$

B1 5pts (a) $\tan x = 0$




(b) $\cos(x) = 0$

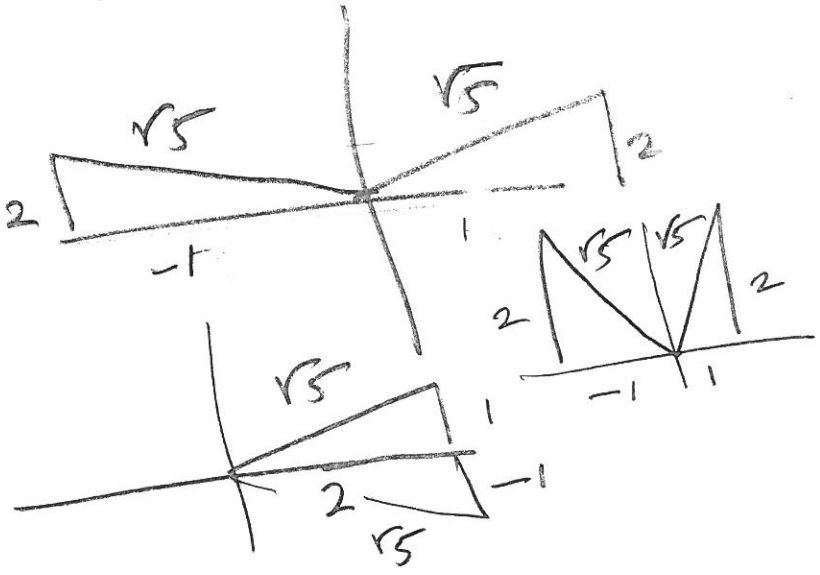



(c) $\sin x = \frac{2}{\sqrt{5}}$

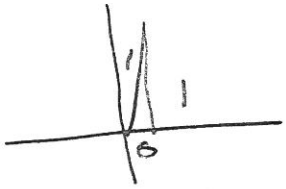
$\sqrt{5}^2 - 2^2$

$= 5 - 4 = 1$

(d) $\sec x = \frac{\sqrt{5}}{2}$




(e) $\sin x = 1$



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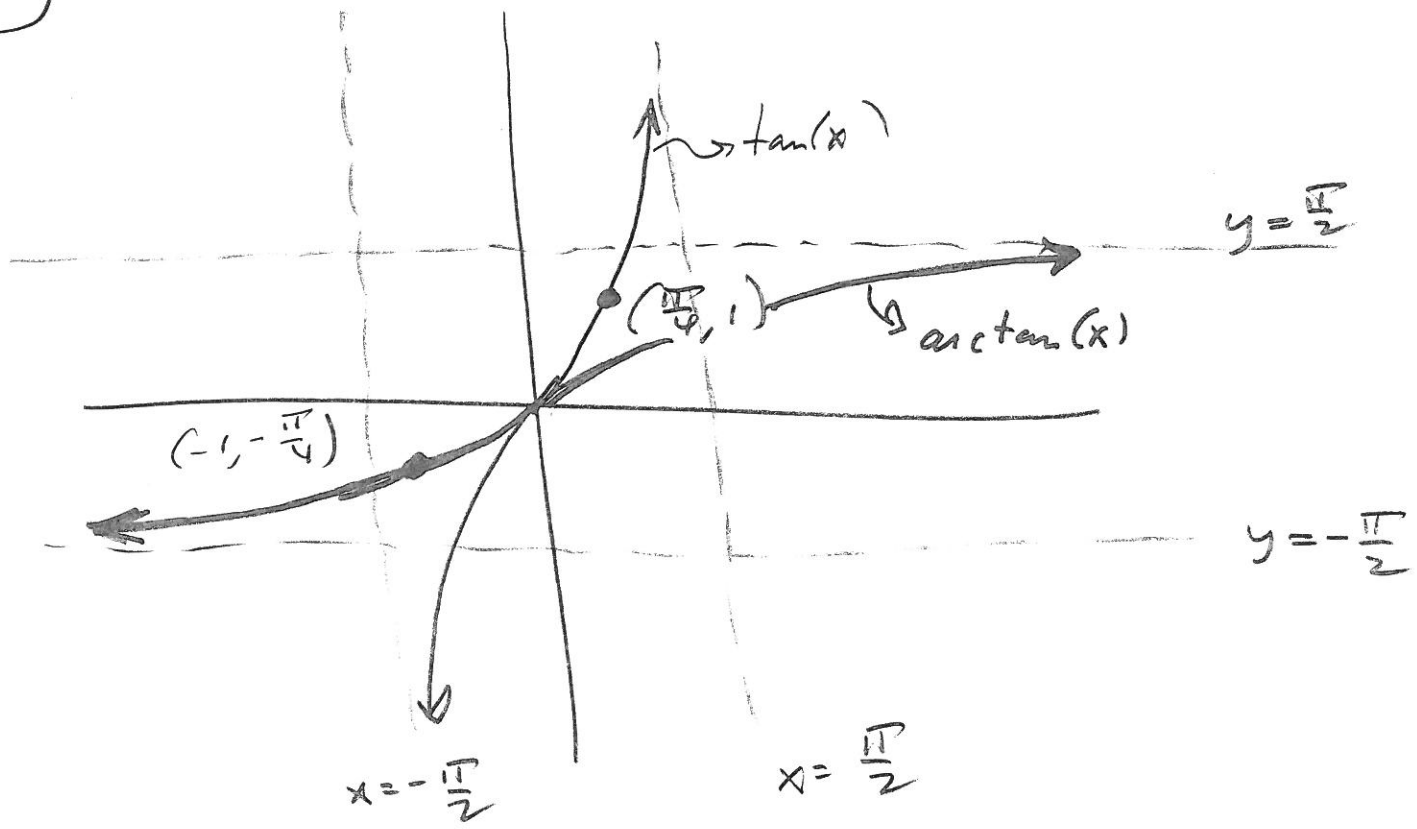
(B2)




(B3) Circumference $= 2\pi r$ @ $\theta = 2\pi$,

so Arc length $= \boxed{r\theta = s}$

Area of a circle is $\pi r^2$ @ $\theta = 2\pi$,

so $\pi r^2 = \frac{1}{2}(2\pi) r^2$ @ so

Area of a sector is $\frac{1}{2}\theta r^2$ OR

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