Minitest 4D - MTH 1210

Dr. Graham-Squire, Fall 2013

Name: Key

I pledge that I have neither given nor received any unauthorized assistance on this exam.

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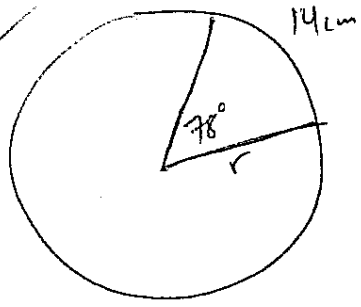
(*signature*)

DIRECTIONS

1. Don't panic.
2. Show all of your work and use correct notation! A correct answer with insufficient work or incorrect notation will lose points.
3. Clearly indicate your answer by putting a box around it.
4. Cell phones and computers are not allowed on this test. Calculators are allowed on the first 2 questions of the test, however you should still show all of your work. No calculators are allowed on the last 4 questions.
5. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
6. If you need it, the quadratic formula is $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
7. Make sure you sign the pledge.
8. Number of questions = 6. Total Points = 40.

1. (5 points) An arc of length 14 cm on a circle subtends a 78° angle. What is the radius of the circle? Round your answer to the nearest 0.01 cm.



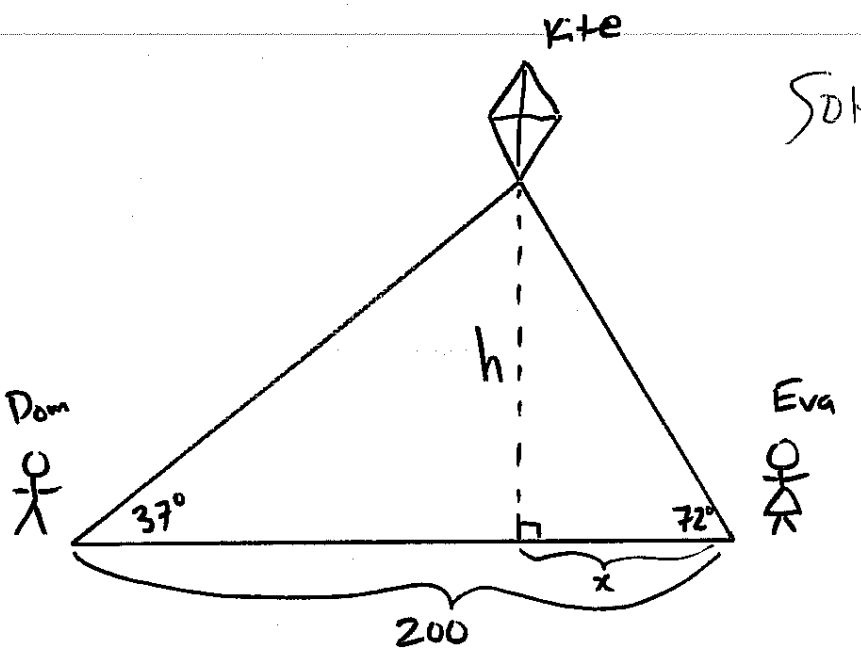
$S = \theta r$

$\theta = 78° \cdot \frac{\pi}{180} = 1.36$

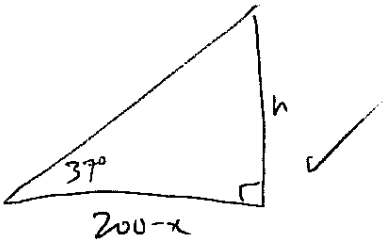
$\frac{14\text{cm}}{1.36} = \frac{1.36 \cdot r}{1.36}$

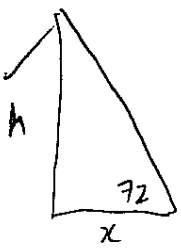
$r = \frac{14}{1.36} = \boxed{10.28\text{cm}}$

2. (7 points) Dominic is flying a kite, and he measures the angle of elevation to the kite to be 37°. His sister Eva is on the other side of the kite, 200 feet away from Dominic, and she measures the angle of elevation to the kite to be 72°. How high is the kite flying? Use right-angle trigonometry to find the solution, and round your answer to the nearest foot.



SOHCAHTOA ✓





$\tan 72° = \frac{h}{x}$ ✓

$\Rightarrow x = \frac{h}{\tan 72°}$

$\tan 37° = \frac{h}{200-x}$ ✓

$\tan 37° = \frac{h}{200 - \left(\frac{h}{\tan 72°}\right)}$ ✓

$0.7536\left(200 - \frac{h}{3.0777}\right) = h$

$150.72 - 0.245h = h$

$\frac{150.72}{1.245} = \frac{1.245h}{1.245} \Rightarrow h = 121.06$ ✓

121 feet

Test D **No Calculator** Name: Key

3. (10 points) Find the exact value of the following. If an expression does not exist, write DNE and explain why.

2 (a) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$

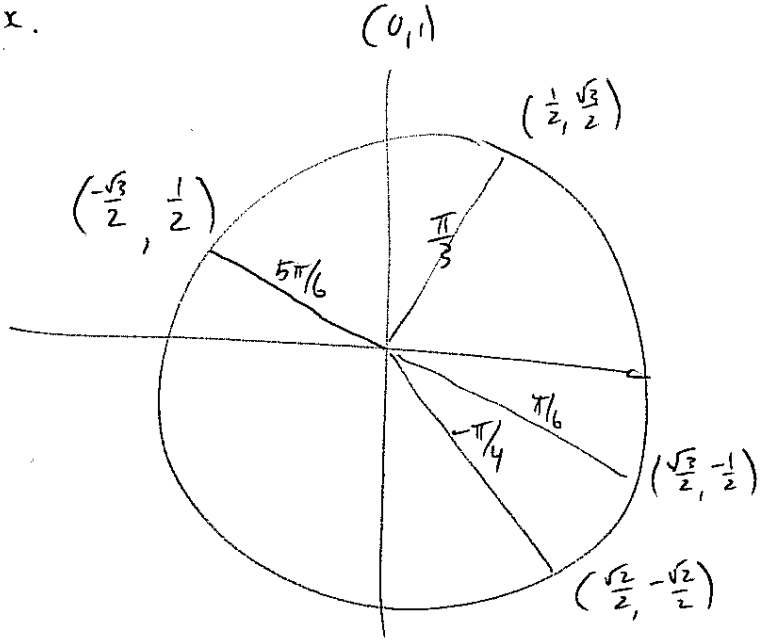
(b) $\tan^{-1}(-1) = \frac{-\pi}{4}$ b/c $\tan\left(\frac{-\pi}{4}\right) = \frac{\frac{-\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = -1$

2 (c) $\cos^{-1}(0) = \frac{\pi}{2}$

(d) $\tan^{-1}\left(\tan\frac{5\pi}{6}\right) = \tan^{-1}\left(\frac{-1}{\sqrt{3}}\right) = \boxed{\frac{-\pi}{6}}$ 0.5 for $\frac{5\pi}{6}$

(e) $\sin\left(\sin^{-1}(2)\right)$ DNE b/c $2 > 1$,

So not in domain of $\sin^{-1}x$.

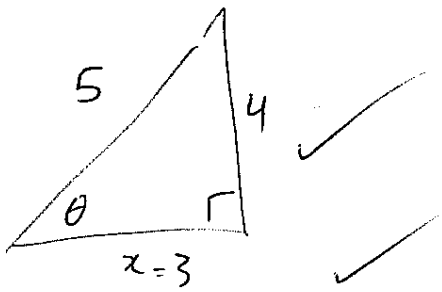


4. (6 points) Find the exact value of $\cos\left(\sin^{-1}\left(\frac{4}{5}\right)\right)$.

$\theta = \sin^{-1}\frac{4}{5}$ ✓

$\Rightarrow \sin\theta = \frac{4}{5}$

want $\cos\theta = \frac{adj}{hyp} = \boxed{\frac{3}{5}}$ ✓



✓ ✓

$5^2 = 4^2 + x^2$ ✓

$25 - 16 = x^2$

$x = 3$ ✓

5. (5 points) Write $\cot\theta$ in terms of $\sin\theta$, assuming θ is in quadrant two.

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\boxed{\cot\theta = \frac{-\sqrt{1-\sin^2\theta}}{\sin\theta}}$$

$$\sin^2\theta + \cos^2\theta = 1$$

$$\cos^2\theta = 1 - \sin^2\theta$$

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

Quad II $\Rightarrow$

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

Or

$$\cot^2\theta + 1 = \csc^2\theta$$

$$\cot\theta = \pm\sqrt{\csc^2\theta - 1}$$

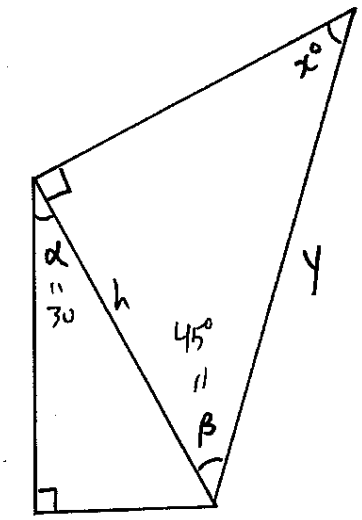
$$\cot\theta = -\sqrt{\frac{1}{\sin^2\theta} - 1}$$

↑

b/c in Quad II.

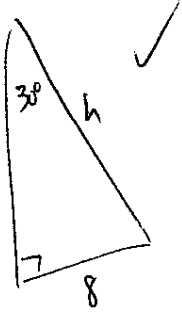
6. (7 points) Solve for x and y in the given diagram. Use trigonometric functions/ratios to explain your calculations and/or show your work. Leave your answer in exact form, since you cannot use a calculator. Let $\alpha = 30°$, $\beta = 45°$, and $A = 8$.

SOHCAHTOA ✓



$180 - 90 - 45 = x°$

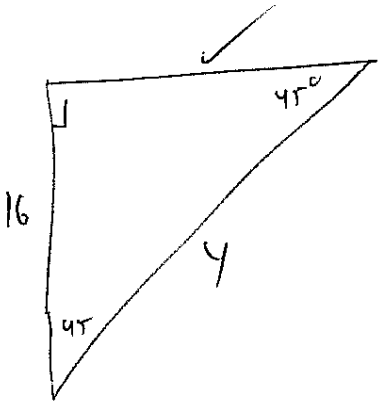
$45 = x$ ✓ ✓



$\sin 30° = \frac{8}{h}$

$h\left(\frac{1}{2}\right) = 8$

$h = 16$ ✓



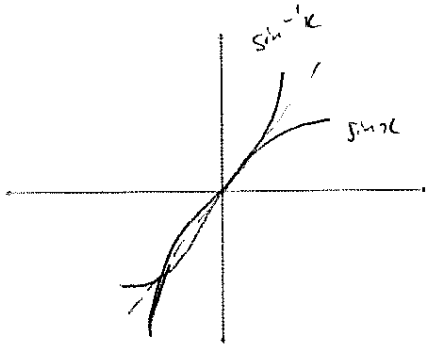
$\cos 45° = \frac{16}{y}$

$\frac{\sqrt{2}}{2} \cdot y = 16$

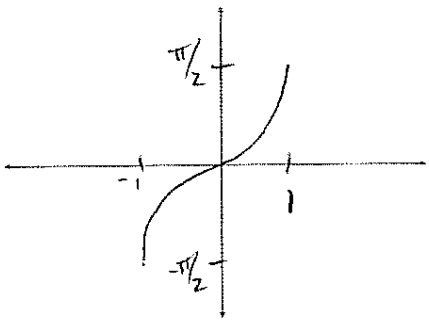
$y = 16 \cdot \frac{2}{\sqrt{2}} = \frac{32}{\sqrt{2}} = 16\sqrt{2}$

Extra Credit(1 point) Sketch the graph of the inverse sine function, $y = \sin^{-1}(x)$.

Rough:



Answer:



Minitest 4C - MTH 1210

Dr. Graham-Squire, Fall 2013

7:48
7:59
11 ⇒ 9ish
35→40 min.

Name: Key

I pledge that I have neither given nor received any unauthorized assistance on this exam.

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(*signature*)

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$\frac{\sin 71^\circ}{200} = \frac{\sin 37^\circ}{\ell}$

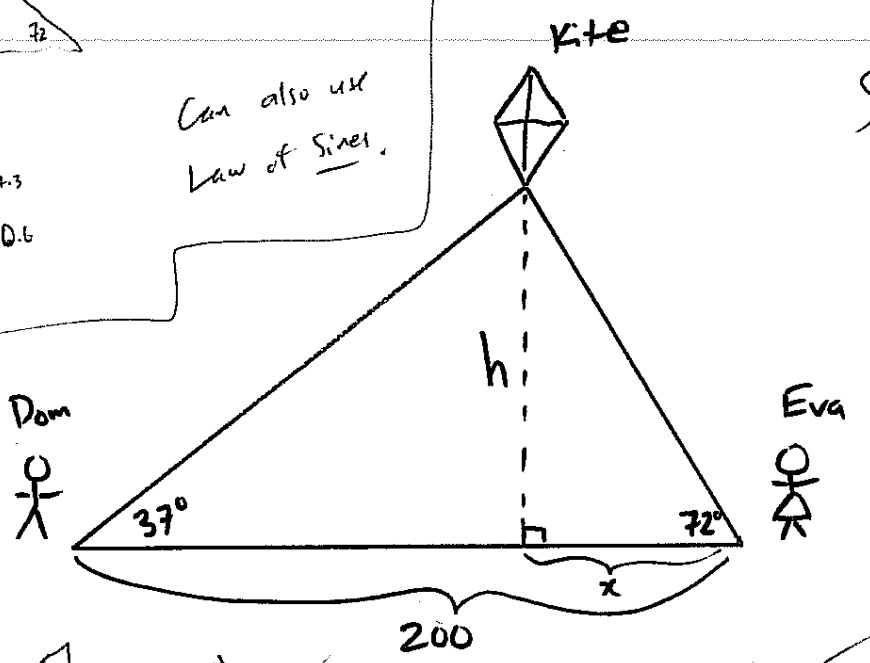
$\ell \approx 127.3$

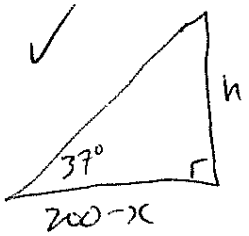
$\sin 72^\circ = \frac{h}{127.3}$

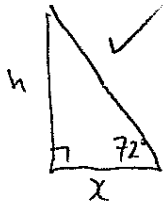
$h \approx 121.06$

Can also use Law of Sines.

SOHCAHTOA ✓







$\tan 72^\circ = \frac{h}{x} \Rightarrow x(\tan 72) = h$

$x = \frac{h}{\tan 72^\circ}$

$\tan 37^\circ = \frac{h}{200 - x}$

$\Rightarrow \tan 37^\circ = \frac{h}{200 - \left(\frac{h}{\tan 72^\circ}\right)}$

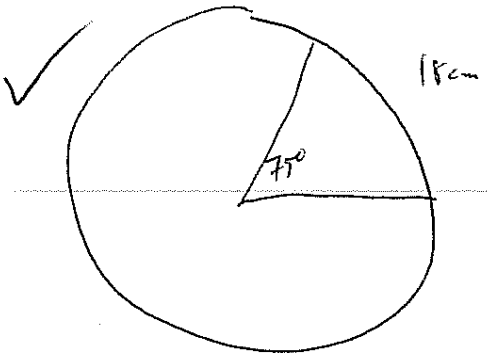
$\Rightarrow \left(200 - \frac{h}{\tan 72}\right)(\tan 37) = h$

$\Rightarrow 200 \tan 37 - h\left(\frac{\tan 37}{\tan 72}\right) = h$

$200 \tan 37^\circ = h + h\left(\frac{\tan 37}{\tan 72}\right)$

$\Rightarrow \frac{200 \tan 37}{1 + \frac{\tan 37}{\tan 72}} = h = \boxed{121 \text{ feet}}$ ✓

2. (5 points) An arc of length 18 cm on a circle subtends a 75° angle. What is the radius of the circle? Round your answer to the nearest 0.01 cm.



✓

$S = \theta r$ ✓

$\frac{18}{1.309} = \frac{1.309\, r}{1.309}$

$r = 13.75$ cm

✓

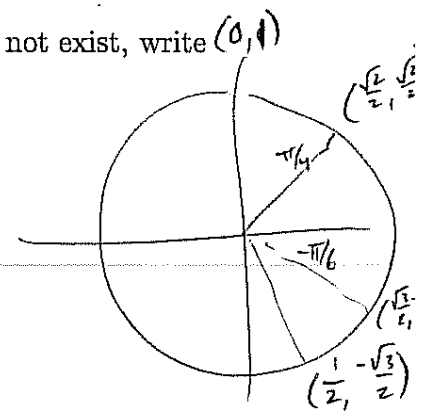
$\theta = 75° \cdot \frac{\pi}{180} = 1.309$

✓ ✓

Test C **No Calculator** Name: Key

3. (10 points) Find the exact value of the following. If an expression does not exist, write DNE and explain why.

(a) $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$ ✓✓



(b) $\cos^{-1}(0) = \frac{\pi}{2}$ ✓✓

✓

$\tan\left(-\frac{\pi}{6}\right) = \frac{\left(-\frac{1}{2}\right)}{\left(\frac{\sqrt{3}}{2}\right)} = -\frac{1}{\sqrt{3}}$

(c) $\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right) = \frac{-\pi}{6}$ ✓

(d) $\sin\left(\sin^{-1}(-2)\right) =$ DNE ✓ b/c ✓ $-2 < -1$

(e) $\tan^{-1}\left(\tan\frac{5\pi}{4}\right) = \tan^{-1}(1) = \frac{\pi}{4}$ ✓ ✓

0.5 for $\frac{5\pi}{4}$

4. (5 points) Write $\tan\theta$ in terms of $\cos\theta$, assuming θ is in quadrant four.

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ ✓

$\sin^2\theta + \cos^2\theta = 1$ ✓

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

$\sin\theta = \pm\sqrt{1-\cos^2\theta}$ ✓

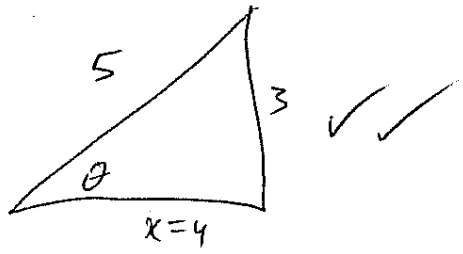
Quad IV $\Rightarrow$ sin is $-$ ✓

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

5. (6 points) Find the exact value of $\cos\left(\sin^{-1}\left(\frac{3}{5}\right)\right)$.

Let $\theta = \sin^{-1}\left(\frac{3}{5}\right)$ ✓ Want $\cos\theta$ ✓

$\Rightarrow \sin\theta = \frac{3}{5}$



✓ ✓

$3^2 + x^2 = 5^2$

$\sqrt{x^2} = \sqrt{16}$ ✓

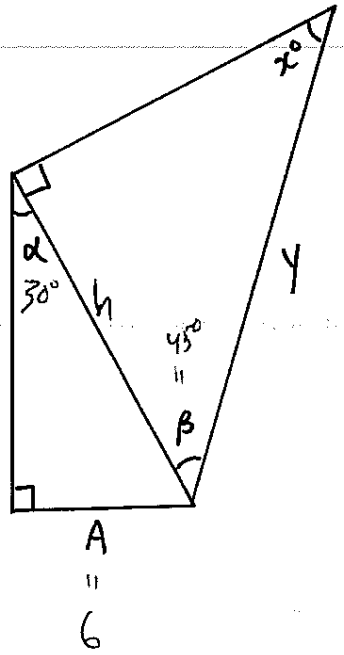
$x = 4$

$\Rightarrow \cos\theta = \boxed{\frac{4}{5}}$ ✓

6. (7 points) Solve for x and y in the given diagram. Use trigonometric functions/ratios to explain your calculations and/or show your work. Leave your answer in exact form, since you cannot use a calculator. Let $\alpha = 30°$, $\beta = 45°$, and $A = 6$.

$x + 45 + 90 = 180$

$\Rightarrow \boxed{x = 45°}$ ✓✓



$\sin 30° = \frac{6}{h}$ ✓

$h \cdot \sin 30° = 6$

So HCAHTOA ✓

$2 \cdot \left(h \cdot \frac{1}{2} = 6 \right) \cdot 2$

$h = 12$ ✓

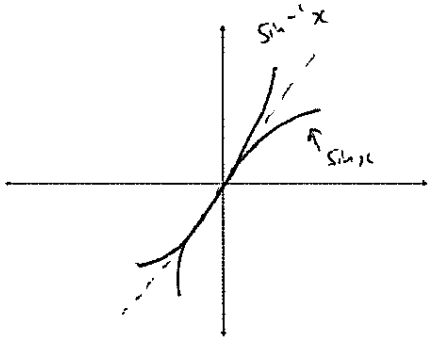
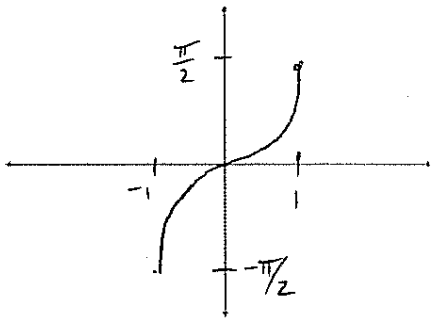
~~$\sin 45° =$~~

$\cos 45° = \frac{h}{y} = \frac{12}{y}$ ✓

$\Rightarrow y = \frac{12}{\cos 45°} = \frac{12}{\left(\frac{\sqrt{2}}{2}\right)} = 12 \cdot \frac{2}{\sqrt{2}} = \boxed{\frac{24}{\sqrt{2}} \text{ or } 12\sqrt{2}}$ ✓

Extra Credit(1 point) Sketch the graph of the inverse sine function, $y = \sin^{-1}(x)$.

Rough:



Answer: