Math 51 (9:30am – 10:20am)
Midterm 2
Thu May 14, 2009

SCORE: ___ / 140 POINTS

BROWN+ ORANGE

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your social security number ? ___ ___
[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER, USE YOUR STUDENT ID NUMBER]

NO CALCULATORS ALLOWED ON THIS SECTION

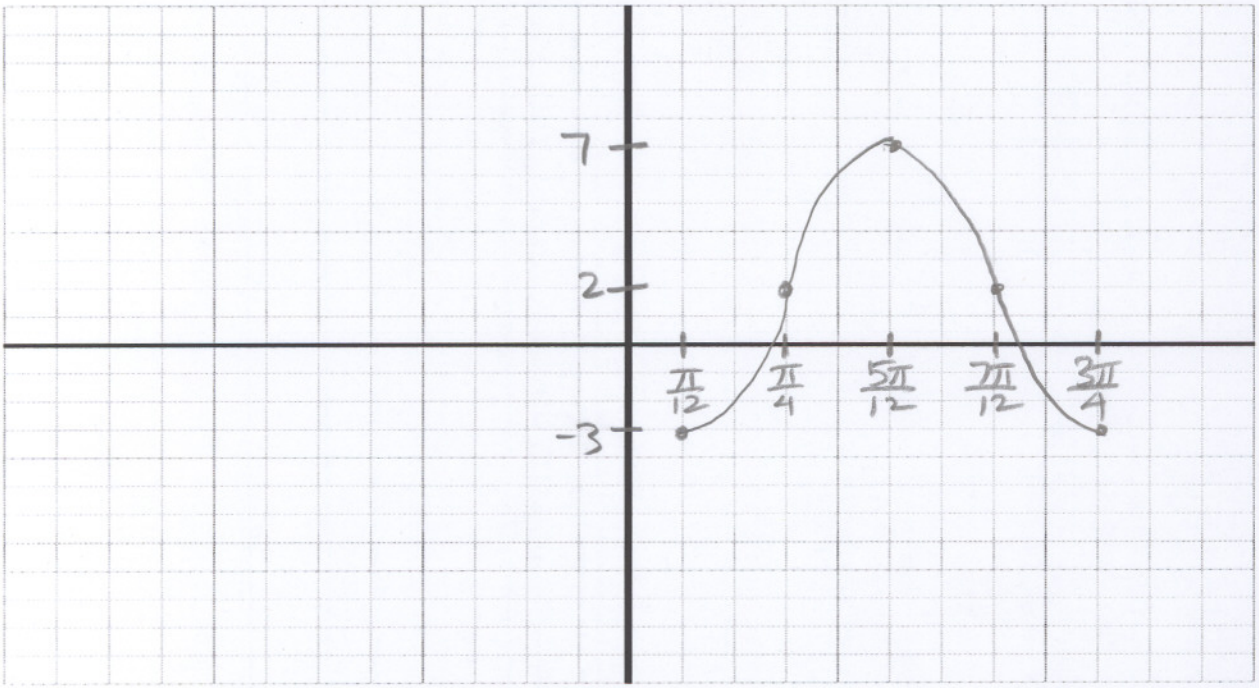
Fill in the circular function values. **SCORE: ___ / 12 POINTS**

$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$ $\cos\frac{\pi}{2} = 0$ $\tan\frac{\pi}{4} = 1$ $\cot\frac{\pi}{6} = \frac{\sqrt{3}}{3}$

Find the circular function values. **SCORE: ___ / 12 POINTS**

$\sin\frac{5\pi}{6} = \frac{1}{2}$ $\tan\frac{8\pi}{3} = -\sqrt{3}$ $\cos\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$

Graph **one period** of $y = -5\cos\left(3x - \frac{\pi}{4}\right) + 2$. Label all relevant x- and y-values discussed in class. **SCORE: ___ / 24 POINTS**



AMPLITUDE = 5

PERIOD = $\frac{2\pi}{3}$ $\frac{1}{4}$ PERIOD = $\frac{\pi}{6}$

MIDLINE $y = 2$ ↔ MAX $y = 2+5 = 7$, MIN $y = 2-5 = -3$

PHASE SHIFT $= -\frac{(-\frac{\pi}{4})}{3} = \frac{\pi}{12}$

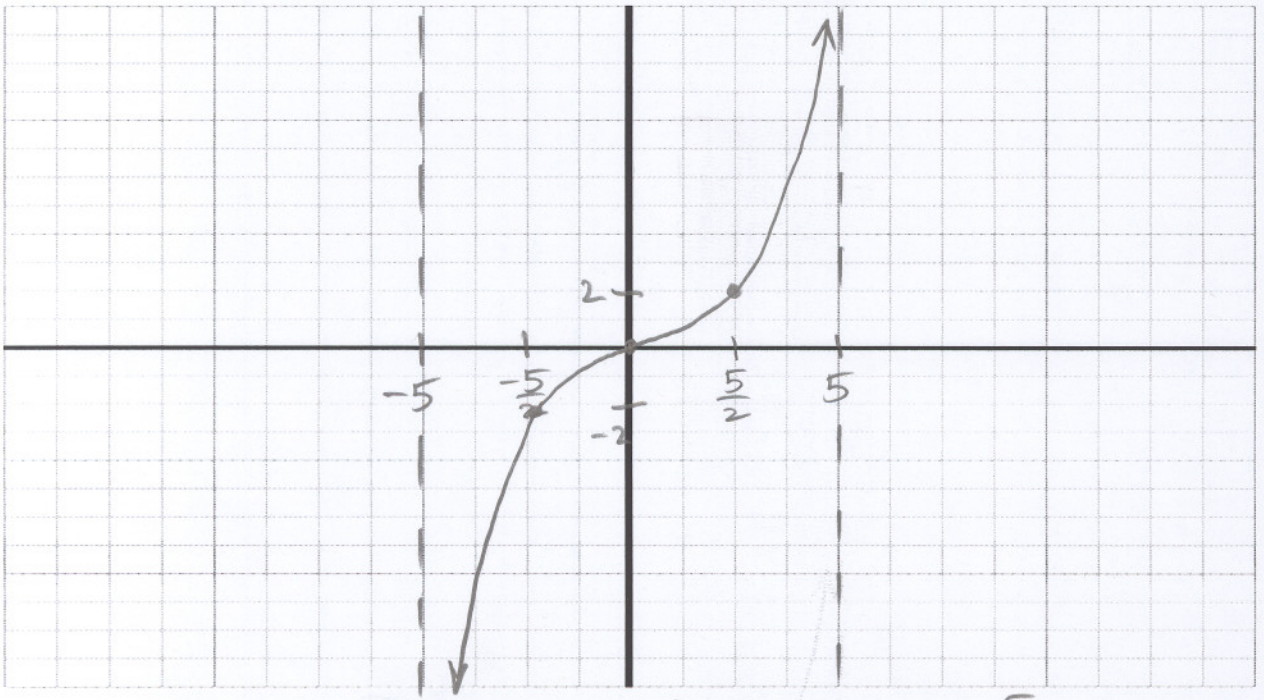
$\frac{\pi}{12} + \frac{\pi}{6} = \frac{\pi}{12} + \frac{2\pi}{12} = \frac{3\pi}{12} = \frac{\pi}{4}$

$+\frac{2\pi}{12} = \frac{5\pi}{12}$

$+\frac{2\pi}{12} = \frac{7\pi}{12}$

$+\frac{2\pi}{12} = \frac{9\pi}{12} = \frac{3\pi}{4}$

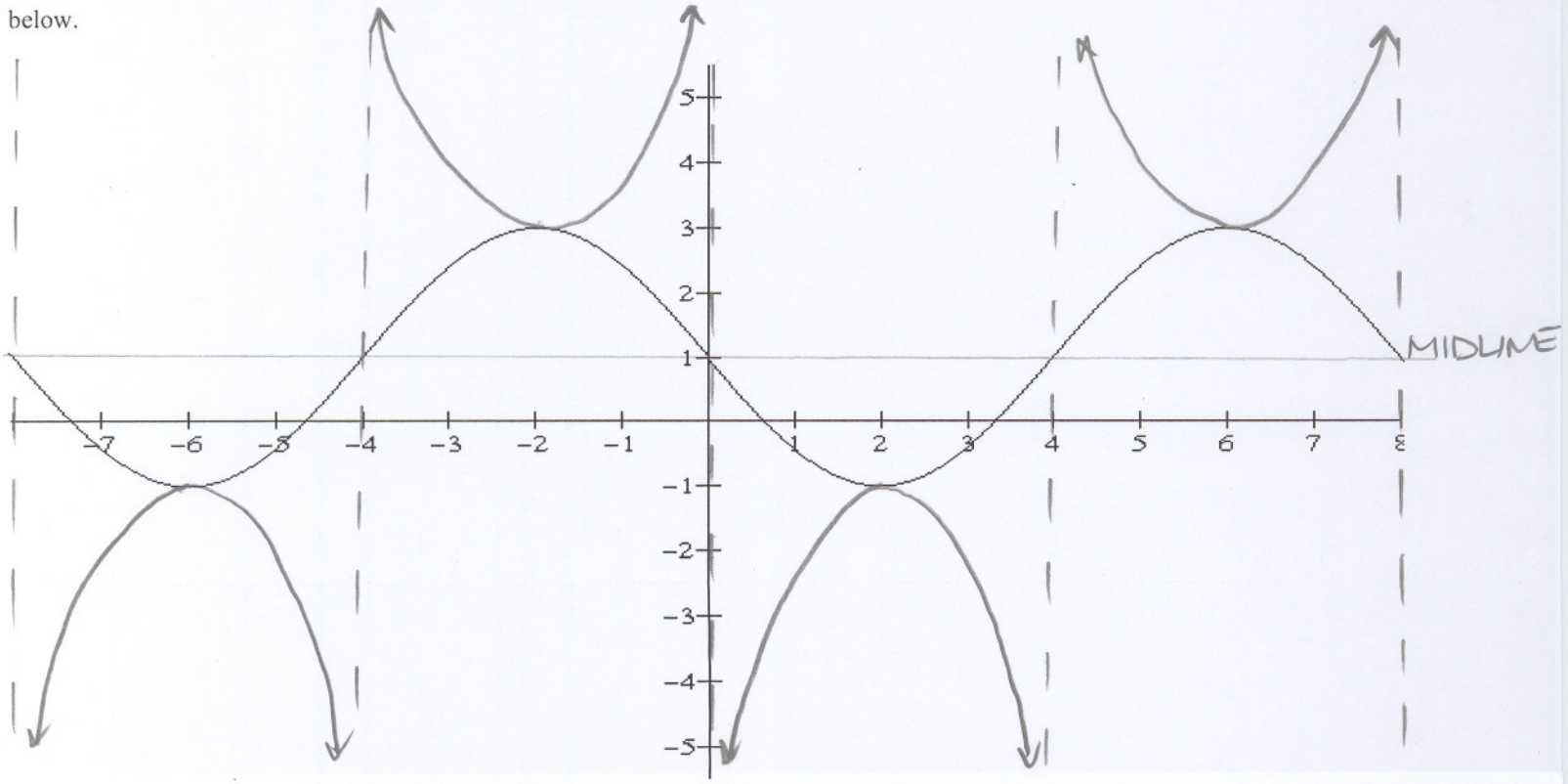
Graph **one period** of $y = 2\tan\frac{\pi x}{10}$. Label all relevant x- and y-values discussed in class. **SCORE: ___ / 16 POINTS**



PERIOD = $\frac{\pi}{\frac{\pi}{10}} = 10$ $\frac{1}{4}$ PERIOD = $\frac{5}{2}$

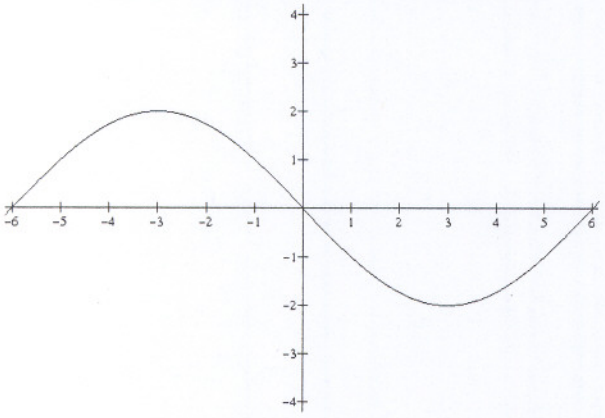
$a = 2$

The graph of $y = -2\sin\left(\frac{\pi x}{4}\right)+1$ is shown below. Sketch the graph of $y = -2\csc\left(\frac{\pi x}{4}\right)+1$ on the axes below. **SCORE: ___ / 10 POINTS**



Find an equation of the form $y = a\sin bx$ or $y = a\cos bx$ for the graph below. **SCORE: ___ / 12 POINTS**

SHOW HOW YOU GOT YOUR ANSWER.



AMPLITUDE $= 2 = |a|$

$a = \pm 2$

UPSIDE DOWN sine $\Rightarrow a = -2$

PERIOD $= 6-(-6) = 12 = \frac{2\pi}{b}$

$12b = 2\pi$

$b = \frac{\pi}{6}$

$y = -2\sin\frac{\pi}{6}x$

Find the exact value of s in $\left[\frac{3\pi}{2}, 2\pi\right]$ such that $\tan s = -\frac{\sqrt{3}}{3}$. **SCORE: ___ / 6 POINTS**

$S = 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$

MULTIPLE CHOICE: Which of the following quantities is positive ? **SCORE: ___ / 4 POINTS**

[A] $\cos 3$ [B] $\sin 3$ [C] $\sin 5$ [D] $\tan 5$

LETTER OF CORRECT ANSWER: B

MULTIPLE CHOICE: Consider the following statements: **SCORE: ___ / 4 POINTS**

[1] $\sin 3.2 < \sin 4.5$
[2] $\cos 3.2 < \cos 4.5$
[3] $\tan 3.2 < \tan 4.5$

Which of the above statements is/are true ?

[A] only [2] is true [B] only [3] is true [C] only [2] and [3] are true [D] all are true

LETTER OF CORRECT ANSWER: C

SUBMIT THIS SECTION BEFORE YOU PICK UP YOUR CALCULATOR

Math 51 (7:30am – 8:20am)
Midterm 2
Thu May 14, 2009

ORANGE + BROWN

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CALCULATORS ALLOWED ON THIS SECTION

Find the value of s in $\left[0, \frac{\pi}{2}\right]$ such that $\cot s = 5$. Round to 3 decimal places. **SCORE: ___ / 6 POINTS**

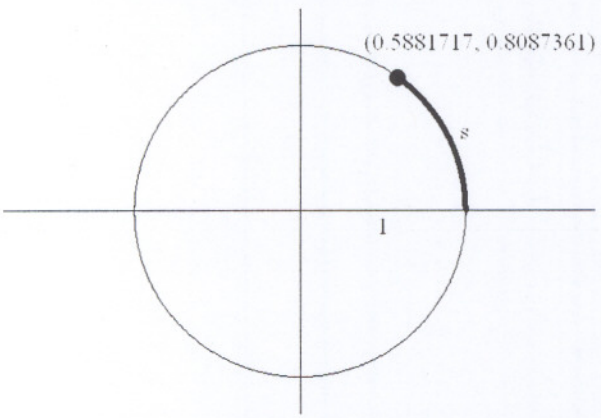
SHOW HOW YOU GOT YOUR ANSWER.

$\tan s = \frac{1}{5}$

$s = \tan^{-1}\frac{1}{5} = 0.197$

Find the value of s in the diagram below. Round to 3 decimal places. **SCORE: ___ / 6 POINTS**

SHOW HOW YOU GOT YOUR ANSWER.

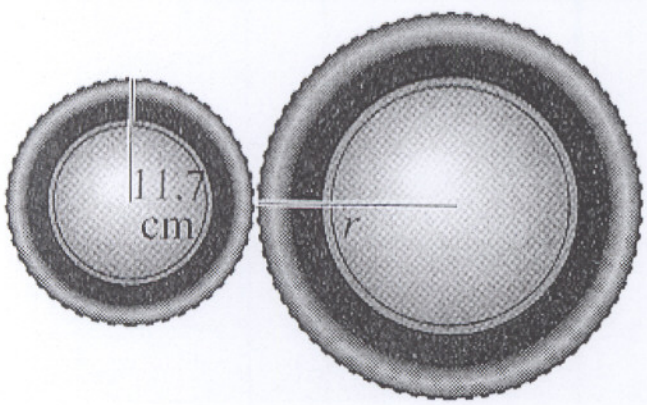


$\cos s = 0.5881717$

$s = \cos^{-1} 0.5881717$

$= 0.942$

Find the radius of the larger wheel in the diagram below if it rotates 85° when the smaller wheel rotates 105°. **SCORE: ___ / 12 POINTS**
Round your answer to 1 decimal place. **SHOW HOW YOU GOT YOUR ANSWER.**



$s_1 = s_2$

$r_1\theta_1 = r_2\theta_2$

$(11.7\text{cm})(105^\circ)\left(\frac{\pi}{180^\circ}\right) = r_2(85^\circ)\left(\frac{\pi}{180^\circ}\right)$

$r_2 = \frac{(11.7\text{cm})(105^\circ)}{85^\circ}$

$= 14.5\text{ cm}$

THE RADIUS OF THE LARGER WHEEL IS 14.5 cm

Convert 2.95 radians to degrees (round to 3 decimal places). **SHOW HOW YOU GOT YOUR ANSWER.** **SCORE: ___ / 4 POINTS**

$$2.95^r \times \frac{180^\circ}{\pi^r} = 169.023^\circ$$

The tires of a bicycle are 13 inches in radius. If the tires are turning at a rate of 280 revolutions per minute, how fast is the bicycle traveling in miles per hour ? Round your answer to 1 decimal place. **SHOW HOW YOU GOT YOUR ANSWER.** **SCORE: ___ / 12 POINTS**

$$v = r\omega$$

$$= 13\text{in} \times \frac{280\text{rev}}{\text{min}} \times \frac{2\pi^r}{\text{rev}} \times \frac{60\text{min}}{\text{hr}} \times \frac{1\text{ ft}}{12\text{in}} \times \frac{1\text{ mi}}{5280\text{ ft}}$$

$$= 21.7 \text{ mi/hr}$$

THE BICYCLE IS TRAVELING 21.7 MPH.

BONUS QUESTION

Find an equation of the form $y = a\sin(bx + c) + d$ or $y = a\cos(bx + c) + d$ for the graph below. **SCORE: ___ / 14 POINTS**

SHOW HOW YOU GOT YOUR ANSWER.