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

YELLOW + PURPLE

SCORE: ___ / 140 POINTS

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

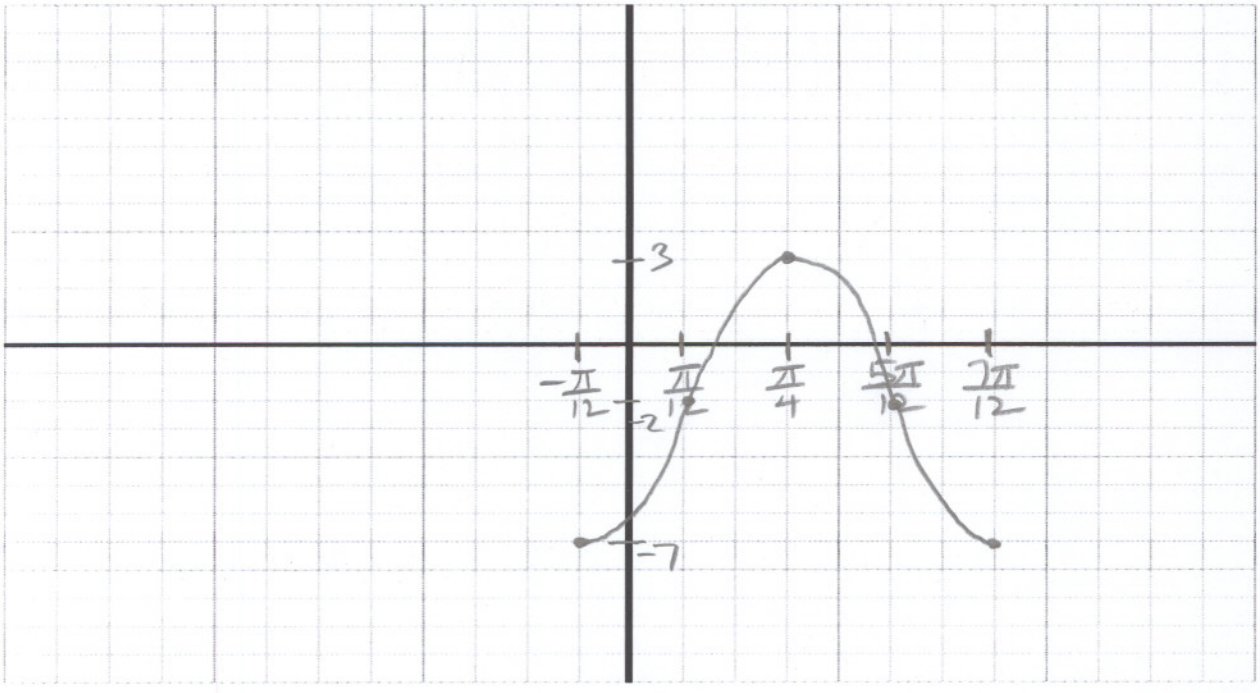
Fill in the circular function values. **SCORE: ___ / 12 POINTS**

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

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

$\sin\frac{7\pi}{6} = -\frac{1}{2}$ $\tan\frac{5\pi}{3} = -\sqrt{3}$ $\cos\frac{9\pi}{4} = \frac{\sqrt{2}}{2}$

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 $y = -2+5 = 3$
MIN $y = -2-5 = -7$

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

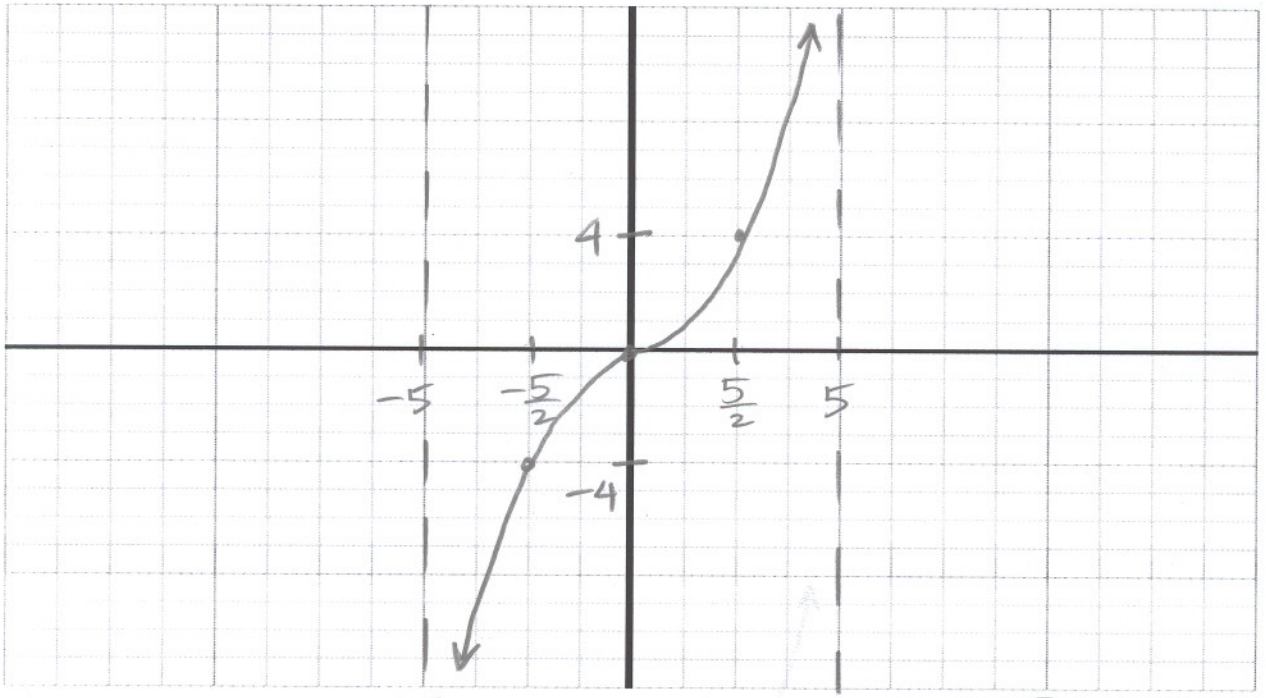
$-\frac{\pi}{12} + \frac{\pi}{6} = -\frac{\pi}{12} + \frac{2\pi}{12} = \frac{\pi}{12}$

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

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

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

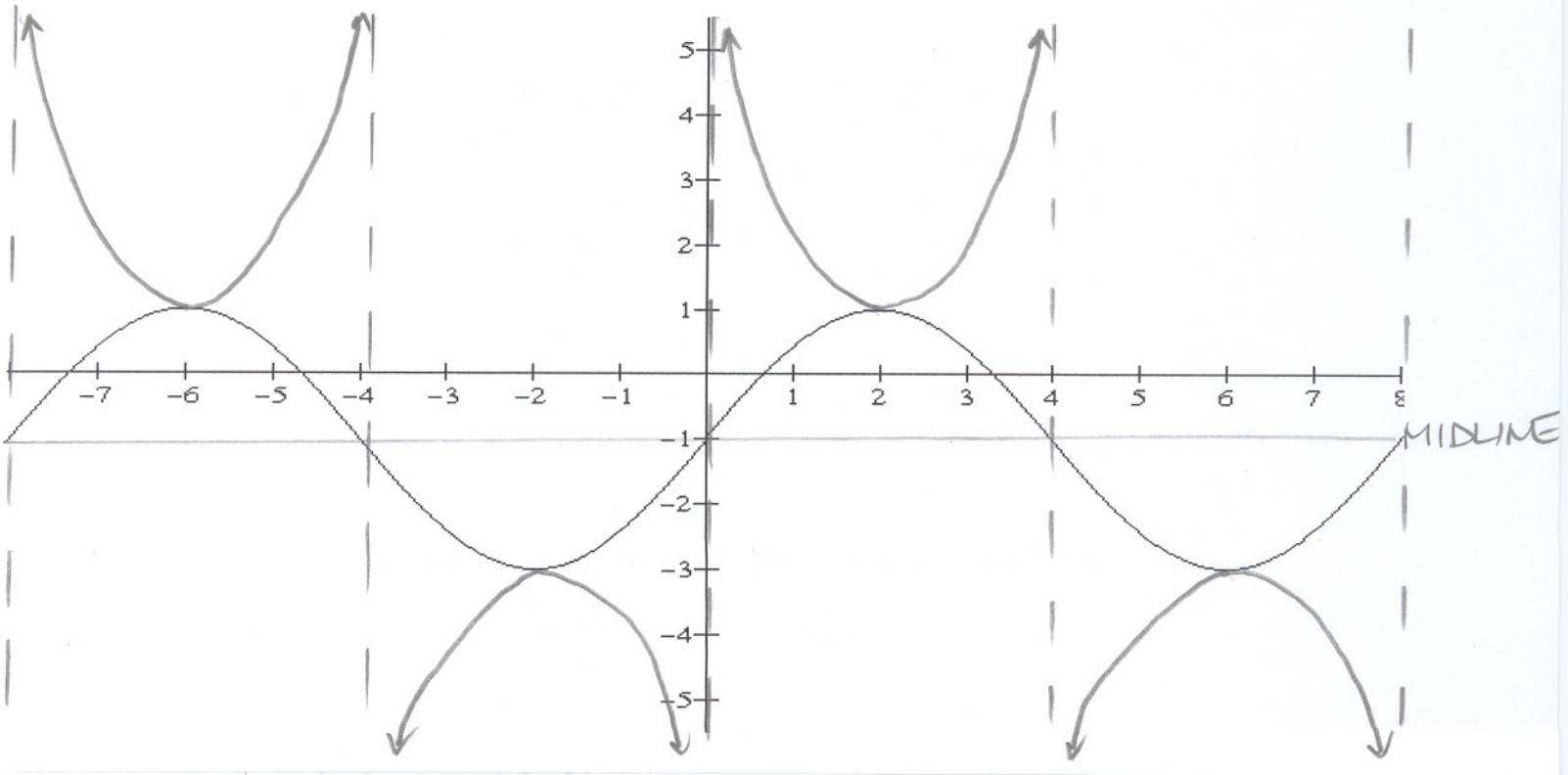
Graph **one period** of $y = 4\tan\frac{\pi x}{10}$. Label all relevant x- and y-values discussed in class. **SCORE: ___ / 16 POINTS**



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

$a = 4$

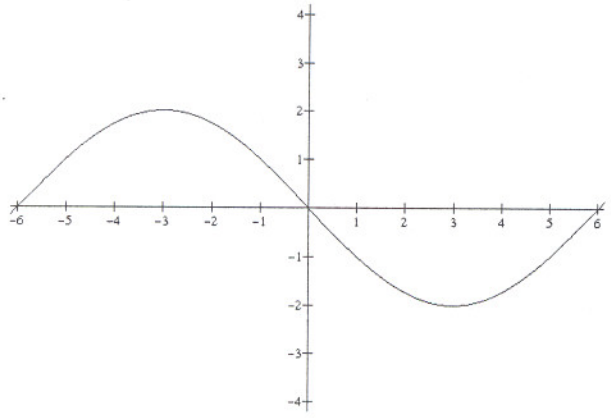
The graph of $y = 2\sin\left(\frac{\pi x}{4}\right) - 1$ is shown below. Sketch the graph of $y = 2\csc\left(\frac{\pi x}{4}\right) - 1$ on the axes below. **SCORE: ___ / 10 POINTS**



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 $\left[\pi, \frac{3\pi}{2}\right]$ such that $\tan s = \frac{\sqrt{3}}{3}$.

SCORE: ___ / 6 POINTS

$s = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$

MULTIPLE CHOICE: Which of the following quantities is positive ?

SCORE: ___ / 4 POINTS

[A] $\sin 2$ [B] $\tan 2$ [C] $\sin 4$ [D] $\cos 4$

LETTER OF CORRECT ANSWER: A

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 [1] is true [B] only [1] and [3] are true [C] none is true [D] only [1] and [2] are true

LETTER OF CORRECT ANSWER: A

SUBMIT THIS SECTION BEFORE YOU PICK UP YOUR CALCULATOR

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CALCULATORS ALLOWED ON THIS SECTION

Find the value of s in $\left[0, \frac{\pi}{2}\right]$ such that $\csc s = 7$. Round to 3 decimal places. **SCORE: ___ / 6 POINTS**

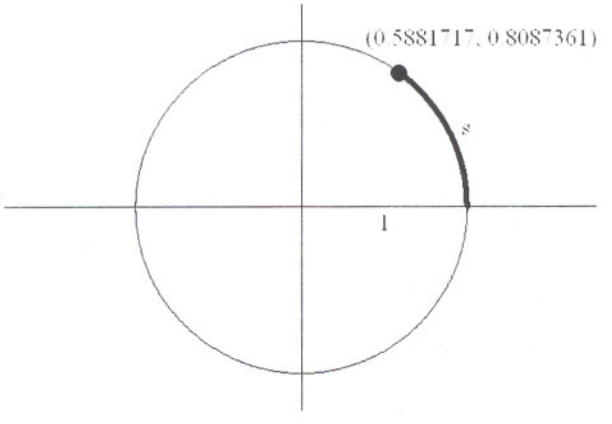
SHOW HOW YOU GOT YOUR ANSWER.

$\sin s = \frac{1}{7}$

$s = \sin^{-1} \frac{1}{7} = 0.143$

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

SHOW HOW YOU GOT YOUR ANSWER.

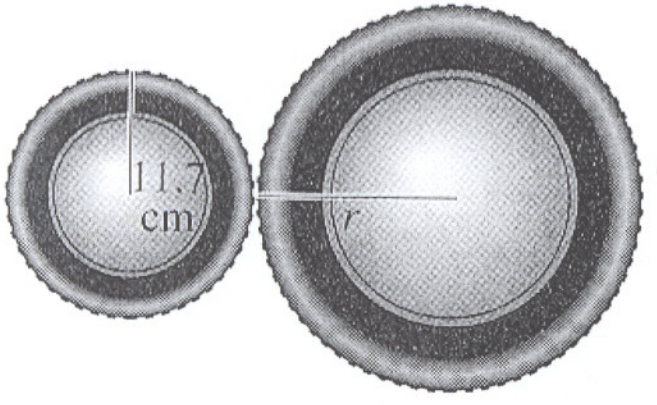


$\cos s = 0.5881717$

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

$= 0.942$

Find the radius of the larger wheel in the diagram below if it rotates 76° when the smaller wheel rotates 106°. **SCORE: ___ / 12 POINTS**
Round your answer to 1 decimal place. **SHOW HOW YOU GOT YOUR ANSWER.**



$s_1 = s_2$

$r_1 \theta_1 = r_2 \theta_2$

$(11.7\text{cm})(106^\circ)\left(\frac{\pi}{180^\circ}\right) = r(76^\circ)\left(\frac{\pi}{180^\circ}\right)$

$r = \frac{(11.7\text{cm})(106^\circ)}{76^\circ}$

$= 16.3\text{cm}$

THE LARGER WHEEL HAS RADIUS 16.3cm

Convert 3.68 radians to degrees (round to 3 decimal places). **SHOW HOW YOU GOT YOUR ANSWER.** **SCORE: ___ / 4 POINTS**

$$3.68^r \times \frac{180^\circ}{\pi r} = 210.848^\circ$$

The tires of a bicycle are 14 inches in radius. If the tires are turning at a rate of 200 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**

$V = r\omega$

$$= 14\,in \times \frac{200\,rev}{min} \times \frac{2\pi r}{rev} \times \frac{60\,min}{hr} \times \frac{1\,ft}{12\,in} \times \frac{1\,mi}{5280\,ft}$$

$= 16.7\ mi/hr$

THE BICYCLE IS TRAVELING 16.7 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.