

Two versions of page 1

This test is in two parts. On part one, you may not use a calculator; on part two, a (non-graphing) calculator is necessary. When you complete part one, you turn it in and get part two. Once you have turned in part one, you may not go back to it. You will show all work on the test paper, no scratch paper is allowed.

PART ONE - NO CALCULATORS ALLOWED

(1) Find the following Trig Values, exactly (2 points each)

* $\sin(5\pi/6) = \underline{1/2}$

$\tan(2\pi/3) = \underline{-\sqrt{3}}$

* $\cos(7\pi/4) = \underline{\sqrt{2}/2}$

$\tan(-\pi/6) = \underline{-\frac{\sqrt{3}}{3}}$

$\cos(0) = \underline{1}$

$\sec(2\pi/3) = \underline{-2}$

$\cot(3\pi) = \underline{\text{undefined!}}$

$\sin(7\pi/6) = \underline{-\frac{1}{2}}$

$\cos(\pi/6) = \underline{\frac{\sqrt{3}}{2}}$

$\csc(\pi/2) = \underline{1}$

* $\cos(13\pi/4) = \underline{-\frac{\sqrt{2}}{2}}$

$\sin(2\pi) = \underline{0}$

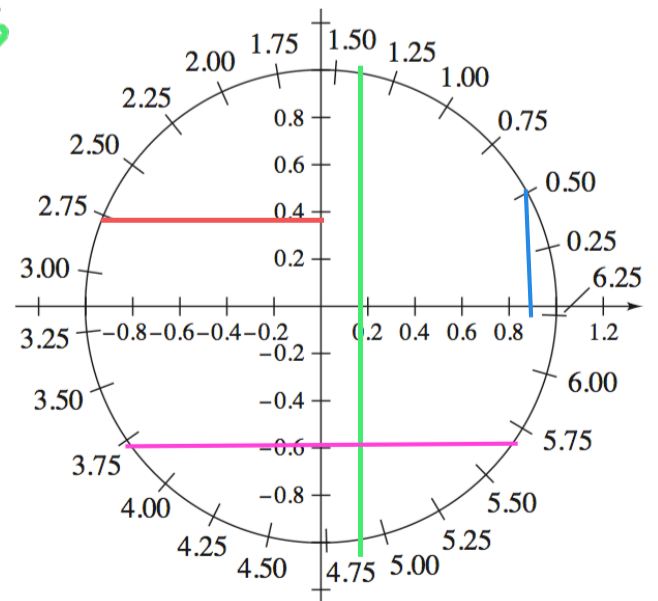
(2) Use the figure to

(1 points each)

(a) approximate the value of $\sin 2.75 \underline{0.39}$ $\cos 0.5 \underline{0.9}$

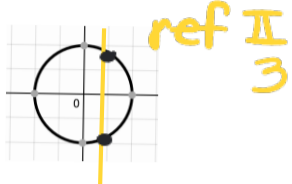
(b) find a value of t such that $\cos t \approx 0.2$ 1.35 4.85

(c) find a value of t such that $\sin t \approx -0.6$ 3.75 5.7



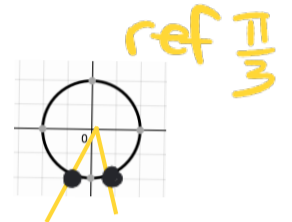
(2) Solve the following equations for the given restriction on t . (If no restriction is given, find all solutions)
 (4 points each)

(a) Solve: $\cos(t) = \frac{1}{2}$ for $0 \leq t < 2\pi$



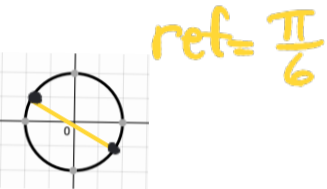
$t = \frac{\pi}{3}, \frac{5\pi}{3}$

(b) Solve: $\sin(t) = -\frac{\sqrt{3}}{2}$ for $0 \leq t < 2\pi$



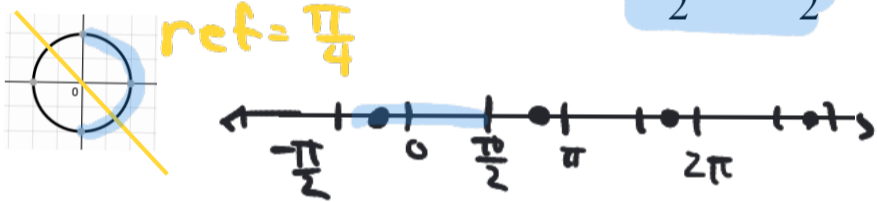
$t = \frac{4\pi}{3}, \frac{5\pi}{3}$

(c) Solve: $\tan(t) = -\frac{\sqrt{3}}{3}$



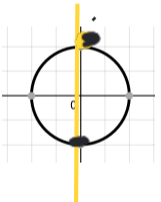
$t = \frac{5\pi}{6} + \pi k, k \text{ integer}$

(d) Solve: $\cot(t) = -1$ for $-\frac{\pi}{2} \leq t < \frac{\pi}{2}$



$t = -\frac{\pi}{4}$

(e) Solve: $\cos(t) = 0$ for $0 \leq t < 2\pi$



$t = \frac{\pi}{2}, \frac{3\pi}{2}$

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PART ONE - NO CALCULATORS ALLOWED

(1) Find the following Trig Values, exactly (2 points each)

$\cos(5\pi/6) = \underline{-\sqrt{3}/2}$ $\tan(-\pi/6) = \underline{\frac{-\sqrt{3}}{3}}$

$\sin(7\pi/4) = \underline{-\sqrt{2}/2}$ $\tan(2\pi/3) = \underline{-\sqrt{3}}$

$\sin(0) = \underline{0}$ $\sec(2\pi/3) = \underline{-2}$

$\tan(3\pi) = \underline{0}$ $\cos(7\pi/6) = \underline{\frac{-\sqrt{3}}{2}}$

$\sec(\pi/6) = \underline{\frac{2}{\sqrt{3}}}$ $\csc(\pi/2) = \underline{1}$

$\sin(13\pi/4) = \underline{\frac{-\sqrt{2}}{2}}$ $\sin(2\pi) = \underline{0}$

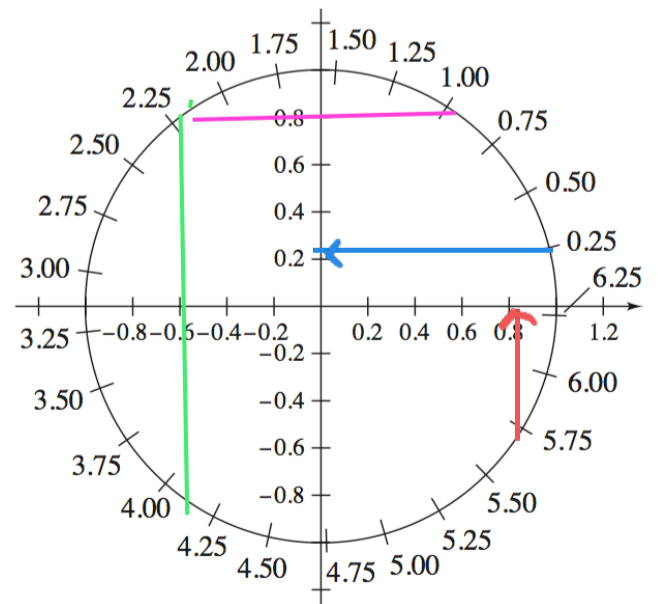
(2) Use the figure to

(1 points each)

(a) approximate the value of $\sin 0.25$ 0.2 $\cos 5.75$ 0.8

(b) find a value of t such that $\cos t \approx -0.6$ 2.25 4.2

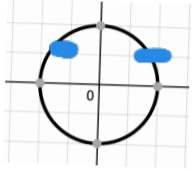
(c) find a value of t such that $\sin t \approx 0.8$ 1, 2.25



(2) Solve the following equations for the given restriction on t . (If no restriction is given, find all solutions)
 (4 points each)

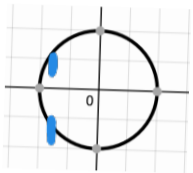
(a) Solve: $\sin(t) = \frac{1}{2}$ for $0 \leq t < 2\pi$

$t = \frac{\pi}{6}, \frac{5\pi}{6}$



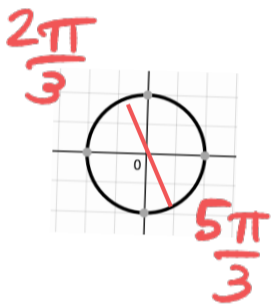
(b) Solve: $\cos(t) = -\frac{\sqrt{3}}{2}$ for $0 \leq t < 2\pi$

$t = \frac{5\pi}{6}, \frac{7\pi}{6}$



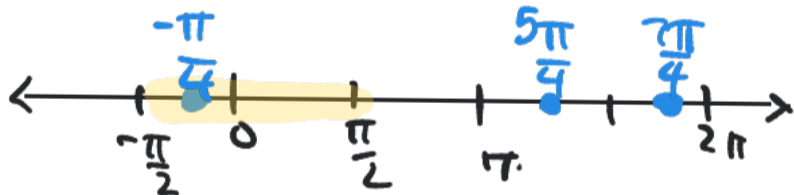
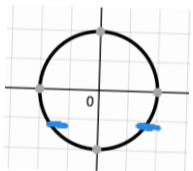
(c) Solve: $\tan(t) = -\sqrt{3}$

$t = \frac{2\pi}{3} + \pi k, k \text{ an integer}$



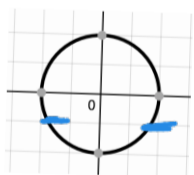
(d) Solve: $\sin(t) = -\frac{\sqrt{2}}{2}$ for $-\frac{\pi}{2} \leq t < \frac{\pi}{2}$

$t = -\frac{\pi}{4}$



(e) Solve: $\csc(t) = -2$ for $0 \leq t < 2\pi$

$t = \frac{7\pi}{6}, \frac{11\pi}{6}$



$\sin(t) = -\frac{1}{2}$

NAME: _____

MATH 8

PART TWO - CALCULATORS ALLOWED (non-graphing)

Show your work on this paper. EXACT answers are expected unless otherwise specified. Show scales on graphs and label highs and lows. Give units in answers when appropriate.

Fill in the blanks. (2 points each)

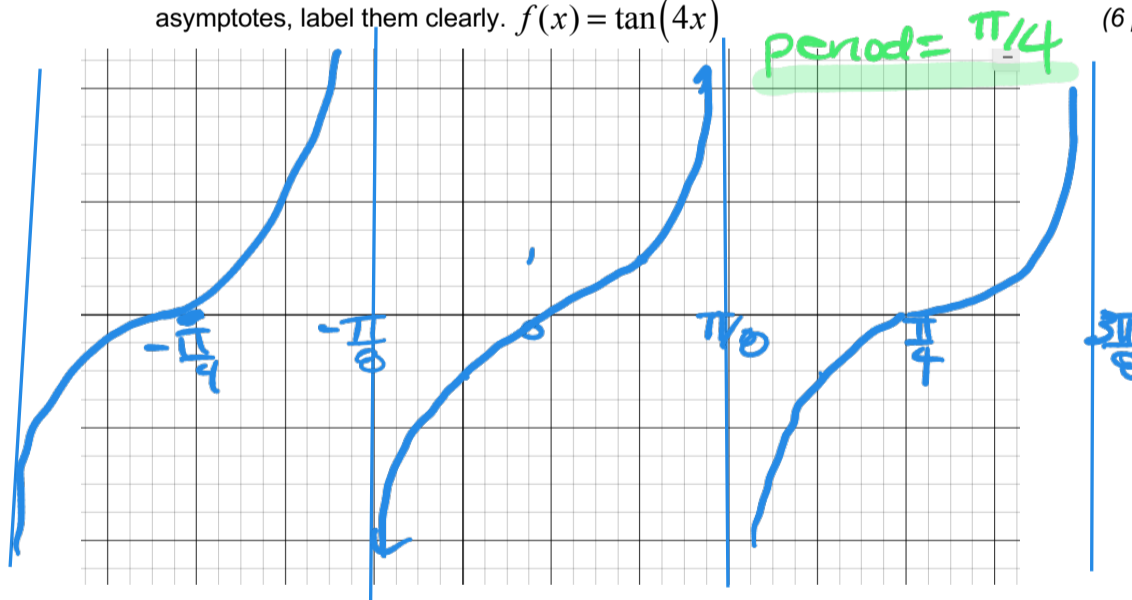
- (1) True or False: $\cos(t) = \cos(-t)$ True cosine is an even function
- (2) What is the domain of $f(t) = \sin(t)$? $(-\infty, \infty)$ ← Note: Parentheses are used with ∞ .
- (3) The reciprocal function for $f(t) = \sin(t)$ is $g(t) =$ $\csc(t)$
- (4) True or False: The range of $f(t) = \tan(t)$ is $[-1, 1]$ False Range is $(-\infty, \infty)$
- (5) What is the period of $f(t) = \cos(3\pi t)$? $\frac{2}{3}$ $\frac{2\pi}{k} = \frac{2\pi}{3\pi} = \frac{2}{3}$

(6) Using your calculator, find approximations for the following, rounded to 2 decimal places. (1 point each)

- (a) $\sin(\pi/10) \approx$.31 (b) $\sec(6) \approx$ 1.04 (c) $\frac{5}{\tan(3)+1} \approx$ 5.83

* Use Calculator memory

(7). Sketch the following graph. (clearly show scale, graph at least TWO periods, If there are any asymptotes, label them clearly. $f(x) = \tan(4x)$ (6 points)



period = $\frac{\pi}{k} = \frac{\pi}{4}$

Asymptote $\tan(4x) = \frac{\sin(4x)}{\cos(4x)}$

denom = 0 \Rightarrow
 $\cos(4x) = 0$
 $4x = \frac{\pi}{2}, \frac{3\pi}{2}, \dots$
 $x = \frac{\pi}{8}, \frac{3\pi}{8}, \dots$

(10 points)

(8) Suppose the displacement of a mass suspended by a spring is modeled by

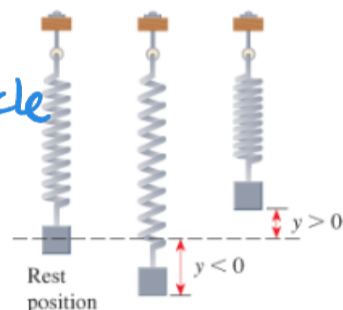
$$y = -5\sin(\pi t) \text{ (where } y \text{ is measured in inches, time in seconds)}$$

a) Find the amplitude, period and frequency of the motion.

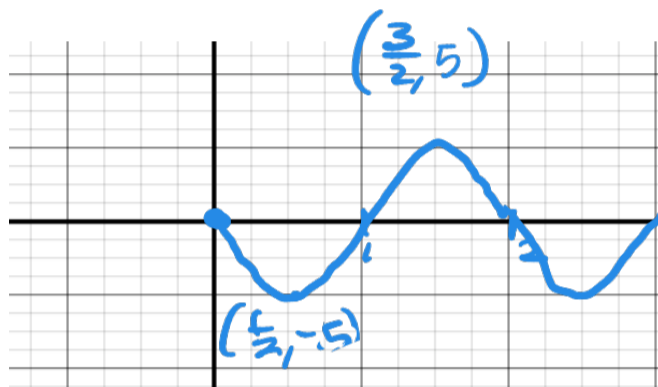
$$A = 5 \text{ inches}$$

$$\text{period} = \frac{2\pi}{K} = \frac{2\pi}{\pi} = 2 \text{ seconds/cycle}$$

$$\text{frequency} = \frac{1}{\text{period}} = \frac{1}{2} \text{ cycles/second}$$



b) Graph displacement as a function of time.



c) Describe how the motion changes if the system is modeled by $y = 5\cos(\pi t)$

In part (a), the motion begins from resting position. Here the mass is compressed to its high point and released from there.

(9) Given $\sin(t) = -\frac{3}{5}$, with t in Quadrant III, find:

(2 points each)

(a) $\cos(t) = -\frac{4}{5}$

(b) $\tan(t) = \frac{3}{4}$

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

$$\cos^2 t = 1 - \sin^2 t = 1 - \left(-\frac{3}{5}\right)^2$$

$$\tan(t) = \frac{\sin(t)}{\cos(t)} = \frac{-3/5}{-4/5}$$

$$\cos^2 t = \frac{16}{25}$$

$$\cos t = \pm \frac{4}{5} \quad \text{⊕}$$

Review simplifying complex fractions

(10) Given $\tan(t) = 4$ and $\sin(t) > 0$ in, find

Q I

(2 points each)

(a) $\sec(t) = \sqrt{17}$

(b) $\cot(t) = \frac{1}{4}$

$$\sec^2 t = 1 + \tan^2 t$$

$$\sec^2 t = 1 + 16$$

$$\sec t = \pm \sqrt{17}$$

$$\sec(t) = \sqrt{17}$$

reciprocal

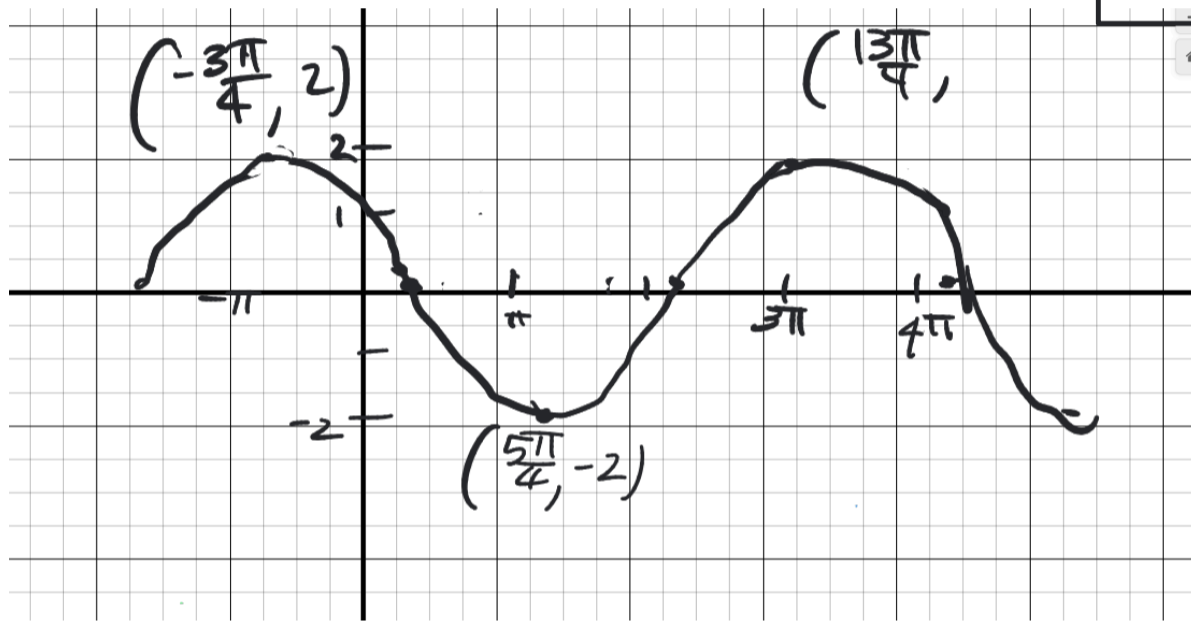
(11) Sketch the following graph. (clearly show scale, graph at least one period, label coordinates of highs and lows) (8 points)

$$f(x) = 2 \cos\left(\frac{1}{2}x + \frac{3\pi}{8}\right) = 2 \cos\left(\frac{1}{2}(x + \frac{3\pi}{4})\right)$$

period = $\frac{2\pi}{1/2} = 4\pi$
 Amplitude = 2
 shift $\frac{3\pi}{4}$ left

Scale

$\frac{1}{4}$ period = $\pi \rightarrow 4$ sq
 shift = $\frac{3\pi}{4} \rightarrow 3$ sq
 1 sq = $\frac{\pi}{4}$



(12) Find an equation corresponding to the graph below. SHOW check for a point. (7 points)

check a point $(\frac{3\pi}{8}, 2)$

$$y = 2 \sin\left(2 \cdot \frac{3\pi}{8} - \frac{\pi}{4}\right)$$

$$= 2 \sin\left(\frac{3\pi}{4} - \frac{\pi}{4}\right)$$

$$= 2 \sin\left(\frac{2\pi}{4}\right)$$

$$= 2 \sin\left(\frac{\pi}{2}\right)$$

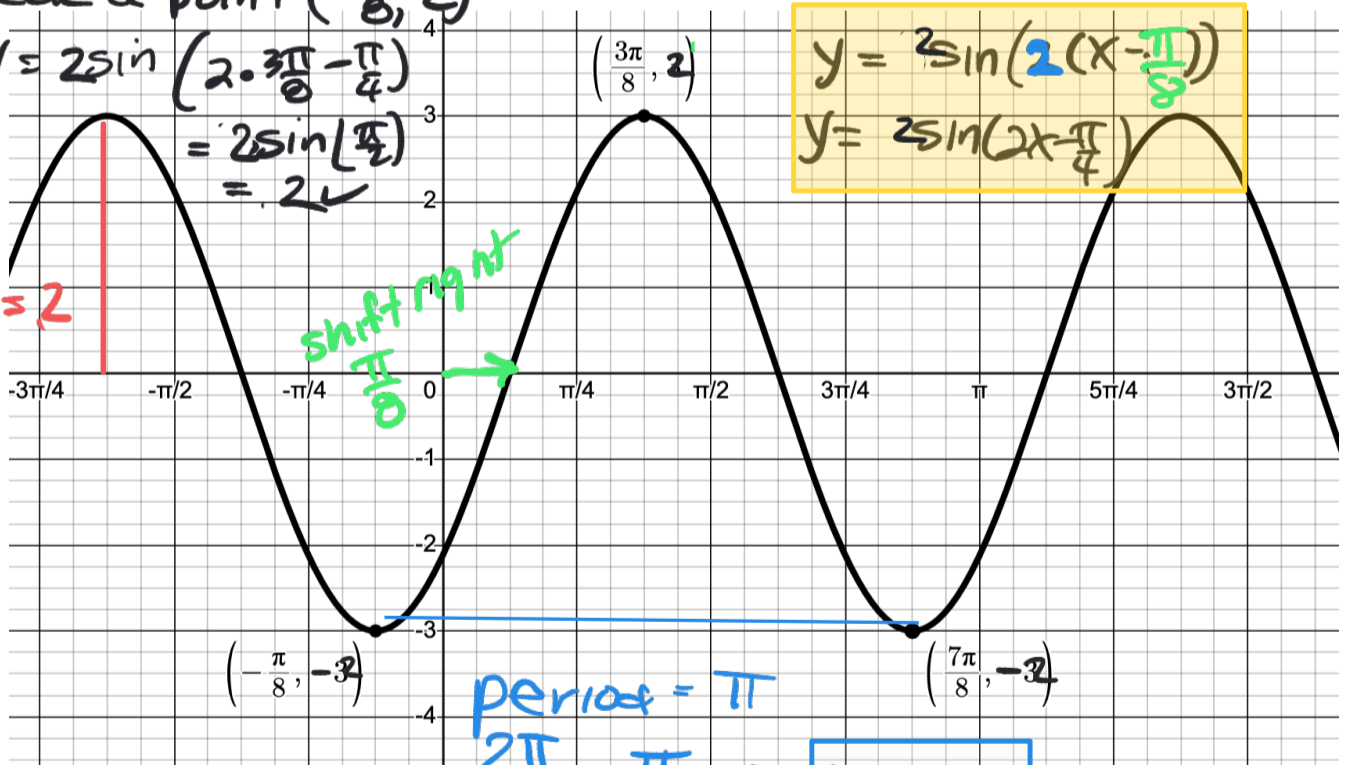
$$= 2$$

$a = 2$

shift right $\frac{\pi}{4}$

$$y = 2 \sin\left(2\left(x - \frac{\pi}{8}\right)\right)$$

$$y = 2 \sin\left(2x - \frac{\pi}{4}\right)$$



period = π

$$\frac{2\pi}{k} = \pi \Rightarrow k = 2$$