Math 105, Section 052 - Quiz 8 **Name:** Solutions
Date: 3/29/18

Write legibly, show work and indicate your final answers. No books, notes, etc. are permitted. Calculators are allowed. This is double sided. Good luck!

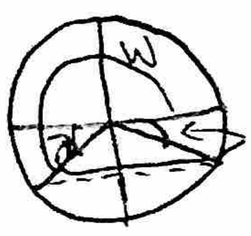
1. (6 *points*) Find all values of t in the interval $-0.5 \le t \le 1$ for which:

$$5\sin(2\pi(t+\frac{1}{4}))+3=0$$

Your answer should be found *algebraically.* To get an extra point, write your answer in exact form and guess what my favorite color is. You must show your work carefully to receive full credit.

$z = 2\pi(t+\frac{1}{4}) \rightarrow 5\sin(z)+3=0$

$\sin(z) = \frac{-3}{5} \rightarrow z = \sin^{-1}(-\frac{3}{5}) = -.6435$



$W = \pi + .6435 = \pi - z$

① $z = -.6435 = 2\pi(t_1+\frac{1}{4}) \rightarrow t_1 = \frac{-.6435}{2\pi} - \frac{1}{4} = -.1024 - \frac{1}{4} = -.3524$ ✓

② $W = \pi + .6435 = 3.785 = 2\pi(t_2+\frac{1}{4}) \rightarrow t_2 = \frac{3.785}{2\pi} - \frac{1}{4} = .3524$

Period $= \frac{2\pi}{B} = \frac{2\pi}{2\pi} = 1$

Solutions: $-.3524, .3524, .6476$ (+1, +1)

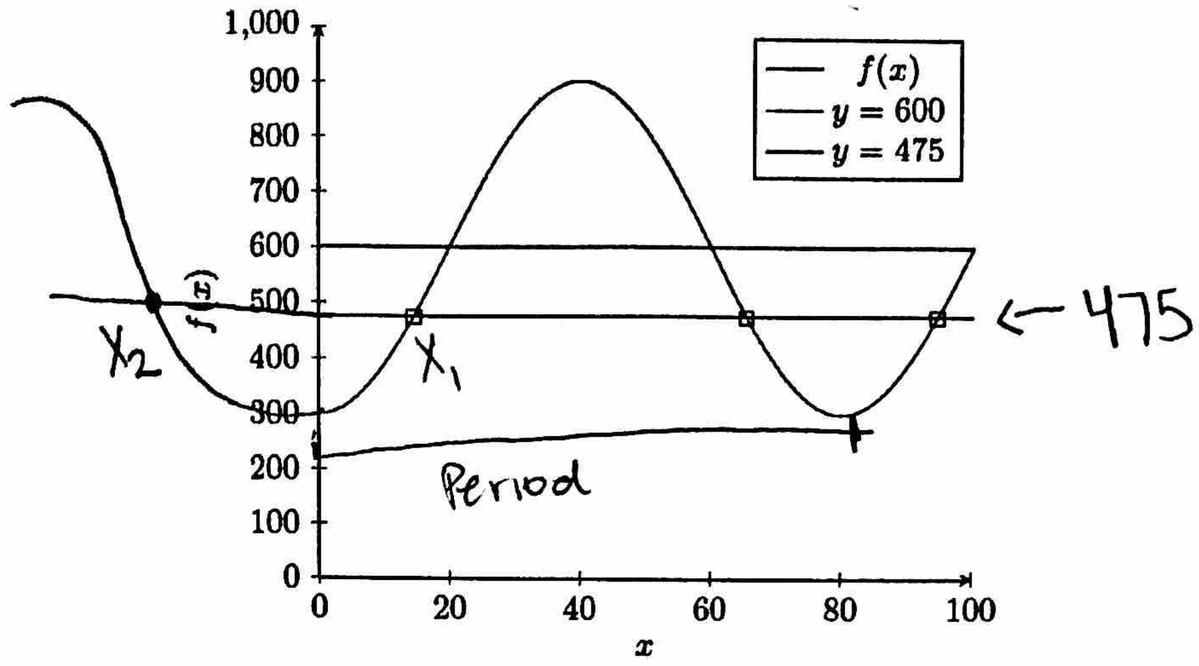
Exact form: $\frac{\sin^{-1}(-\frac{3}{5})}{2\pi} + \frac{1}{4}, \frac{\pi - \sin^{-1}(-\frac{3}{5})}{2\pi} - \frac{1}{4}, \frac{\sin^{-1}(-\frac{3}{5})}{2\pi} + \frac{3}{4}$

Solutions: _____

2. (9 *points*) The formula for the figure below can be written in the following general form:

$$y = f(x) = A\cos(Bx) + K$$

where A,B, and K are values we can find from the figure.



(a) Find the formula for $f(x)$. Hint: Your value for A should be negative.

max = 900 min = 300

midline: $y = \frac{max+mid}{2} = \frac{900+300}{2} = 600$

amp: max − midline = 900 − 600 = 300

Period = 80 $B = \frac{2\pi}{Period} = \frac{2\pi}{80} = \frac{\pi}{40}$

At $x = 0$, $f(0) = 300$

$f(x) = \underline{-300\cos(\frac{\pi}{40}x) + 600}$

(b) Find the x-coordinates of the three points indicated by the square markers.

This is another way to ask you to use inverse trig to find multiple solutions.

Our solutions will be between [0, 100]. Period = 80

Set formula in (a) equal to 475

① $475 = -300\cos(\frac{\pi}{40}x) + 600$

$-125 = -300\cos(\frac{\pi}{40}x)$

$z = \frac{\pi}{40}x$

$-125 = -300\cos(z)$

$-\frac{125}{-300} = \cos(z) \rightarrow z = \cos^{-1}(\frac{125}{300})$

$z = 1.141$

$1.141 = \frac{\pi}{40}x_1 \rightarrow x_1 = \frac{40(1.141)}{\pi} = 14.527$

② $w = -z = -1.141$

$-1.141 = \frac{\pi}{40}x$

$\frac{40(-1.141)}{\pi} = -14.527 = x_2$

I extended the given graph to show where x_2 is

③ Solutions

14.527, $x_2 + 80$, 14.527 + 80

14.527, 65.472, 94.527

The x-coordinates are: _____