Math 4050 **Practice Problem Set #5**

Problem 5.1 Simplify $\sin\left[\cos^{-1}\left(-\frac{5}{9}\right)\right]$.

Problem 5.2 Simplify the expression

$$\frac{\tan x}{1+\sec x} - \frac{\tan x}{1-\sec x}$$

Your final answer should *not* include any fractions.

Problem 5.3 Change the equation

$$r = \frac{4}{3 - 3\sin\theta}$$

into an equation in rectangular coordinates. Your final answer should have only y on one side of the equation and an expression involving x on the other side.

Problem 5.4 Evaluate the given expressions. No partial credit will be given for incorrect answers.

- $\tan^{-1}(1) =$ _____
- $\sin^{-1}\left(\frac{1}{2}\right) =$ _____
- $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) =$ _____
- $\cos^{-1}(0) =$ _____
- $\sin^{-1}(-1) =$ _____
- $\tan^{-1}\left(\sqrt{3}\right) =$ _____
- $\cos^{-1}\left(-\frac{1}{2}\right) =$ _____
- $\tan^{-1}\left(\tan\frac{\pi}{4}\right) =$ _____
- $\sin\left(\sin^{-1}(0.7)\right) =$ _____
- $\cos^{-1}\left(\cos\frac{5\pi}{6}\right) =$ _____

Problem 5.5 As we breathe, our lungs decrease and increase in volume. The volume of air that we inhale and exhale with each breath is called the *tidal volume*.

Suppose a man watching television breathes once every 5 seconds. His average lung capacity is 2500 mL, and his tidal volume is 500 mL. Assuming that his lung capacity oscillates in simple harmonic motion, find a formula for $V(t)$, the volume of the lungs after t seconds. You may assume that the lungs are at their maximum volume at time 0.

Problem 5.6 Simplify the expression $\cos\left[\tan^{-1}(2x)\right]$.

Problem 5.7 In rectangular coordinates, the point P is represented by $(-4, 4)$. Find three different representations of P using polar coordinates.

Problem 5.8 Sketch two cycles of the graph of $y = 2\sin\left(2x - \dfrac{\pi}{2}\right) + 3$.

Problem 5.9 Use the substitution $u = 3\sec x$ to simplify $\dfrac{u^4}{(u^2-9)^2}$.

Problem 5.10 Simplify the expression $\sin x + \cos x \cot x$.

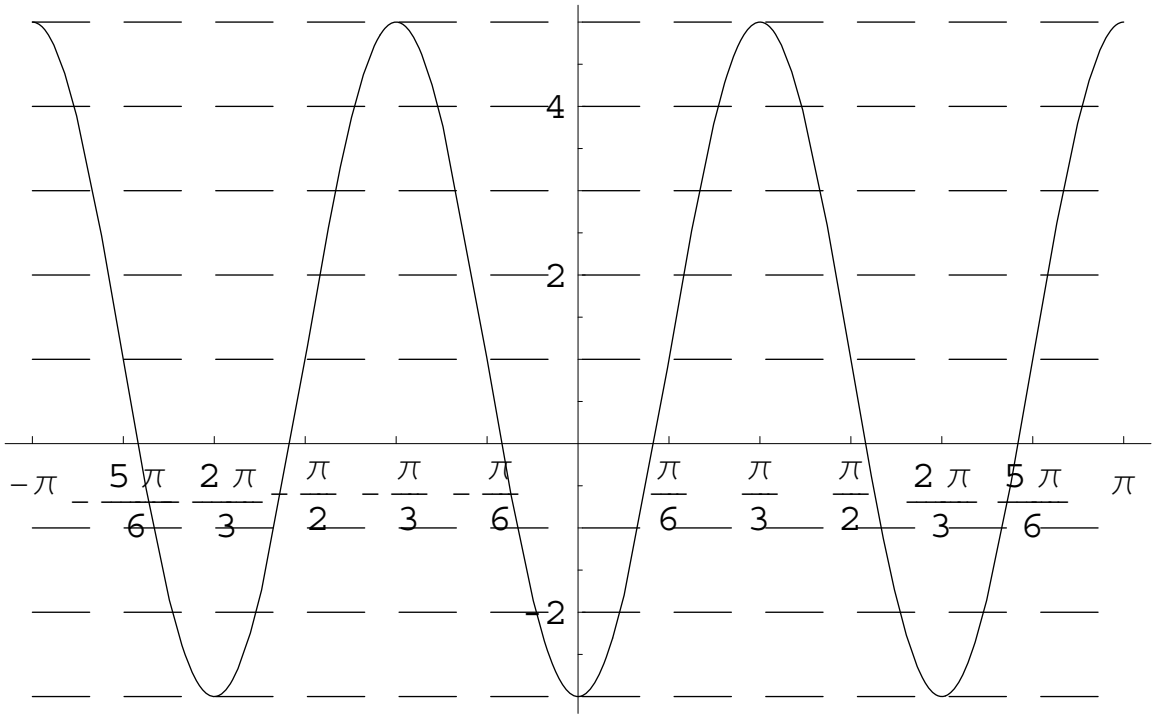
Problem 5.11 Sketch the graph of

$$r = \frac{3}{1 + 0.5\sin\theta} = \frac{6}{2 + \sin\theta}$$

Hint: You can draw an acceptable sketch after plotting only four points.

Problem 5.12 Find numbers a, b, ϕ and c so that the graph below may be represented as

$$f(x) = a\sin(b[x - \phi]) + c$$



Problem 5.13 Find the angles in $\triangle ABC$ if $a = 12$, $b = 14$, and $c = 15$.

Problem 5.14 Triangle $\triangle ABC$ has sides $a = 9$, $b = 10$, and $c = 15$. Find the area of $\triangle ABC$, rounded to two decimal places.

Problem 5.15 Triangle $\triangle ABC$ has sides $a = 15$, $b = 19$, and $\alpha = 40°$. Find c, accurate to one decimal place.