Math 12 **Name (Print):** ____________________

Exam 3: Chapter 7-10/24/13

Write all responses on separate paper. Remember to organize your work clearly. You may *not* use your books, notes, or any calculator on this exam.

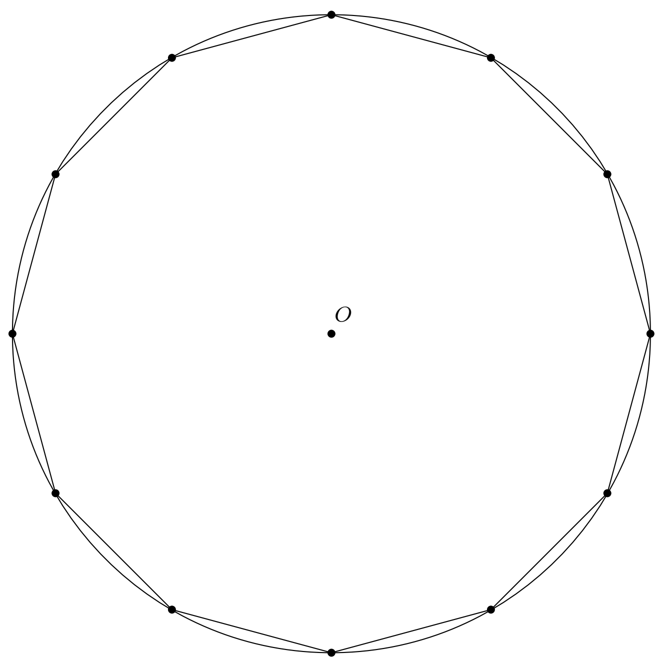
1. (10 points) Use the substitution $x = \frac{2}{5}\sec\theta$ to simply the expression $\frac{\sqrt{25x^2-4}}{x^2}$

2. (10 points) Simplify the expression as much as possible: $\tan(\phi) + \frac{\cos\phi}{1+\sin\phi}$

3. (10 points) Find coefficients A and B so that $A\sin(4\theta) + B\cos(4\theta) = 2\sin\left(4\theta + \arctan(\sqrt{3})\right)$.

4. (15 points) Given that $\sec(\theta) = -3$ and θ is in quadrant II, find the following:
   (a) $\cos(2\theta)$.
   (b) $\sin(2\theta)$
   (c) $\tan(2\theta)$

5. (10 points) Find the perimeter of a regular polygon with twelves sides (a dodecagon) inscribed in the unit circle (radius = 1) as shown below. Do not approximate.



6. (10 points) Use the addition identities to prove the product to sum identity,
   $\sin\alpha\sin\beta = \frac{1}{2}(\cos(\alpha-\beta) - \cos(\alpha+\beta))$

7. (10 points) Consider the point $\left(\cos\left(\frac{\pi}{12}\right), \sin\left(\frac{\pi}{12}\right)\right)$ on the unit circle.
   (a) Use the addition identity on $\frac{\pi}{12} = \frac{\pi}{3} - \frac{\pi}{4}$ to find simplified radical forms for the coordinates.
   (b) Use the half angle formula on $\theta = \frac{\pi}{6}$ to find different simplified radical forms for the coordinates.

8. (9 points) Use the addition identities to express $\cos(3x)$ as cubic polynomial in $\cos(x)$.

9. (16 points) Find all solutions in the interval $[0, 2\pi)$ for each equation.
   (a) $2\sin(5\theta) - \sqrt{3} = 0$
   (b) $3\cos^2(\theta) - 7\cos(\theta) + 2 = 0$