Eastern Oregon University
Concurrent Enrollment/Credit by Proficiency Program

Math 112, Spring, 2016 Exam 3 name/school:_____

Show any relevant work. For each problem, circle your answer.

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1. (20 points) Verify each of the following identities:
   a. $(\sin x + \cos x)^2 = 1 + 2\sin x \cos x$

   b. Use a sum or difference formula to verify: $\sin(x + y) - \sin(x - y) = 2\cos x \sin y$

2. (16 points) Find all solutions to each equation in the interval $0 \leq \theta \leq 2\pi$:
   a. $\cos^2\theta(2\cos\theta - 1) = 0$

   b. $\cos 2\theta - \cos^2\theta = 0$

3. (24 points) Use addition or subtraction formulas, double-angle or half-angle formulas as appropriate to evaluate each of the following expressions.

   a. $\sin \dfrac{\pi}{12}$

Suppose $\cos x = \frac{2}{5}$ and x is a quadrant IV angle. Find each of the following:

   b. $\cos 2x$

   c. $2 \sin 2x$

   d. $\cos \dfrac{x}{2}$

4. (24 points) Let $\mathbf{u} = \langle 3, 5 \rangle,\ \mathbf{v} = \langle -1, 4 \rangle$. Find each of the following:

   a. $2\mathbf{u} - \mathbf{v}$

   b. $\mathbf{u} \cdot \mathbf{v}$

   c. $\text{proj}_{\mathbf{v}}\mathbf{u}$

   d. Resolve $\mathbf{u}$ into $\mathbf{u}_1$ and $\mathbf{u}_2$ such that $\mathbf{u}_1$ is parallel to $\mathbf{v}$ and $\mathbf{u}_2$ is perpendicular to $\mathbf{v}$.

5. (16 points) A small plane is flying through a wind which is blowing 30 mph in direction due east. The plane has a speed of 160 mph relative to air and is headed in the direction of N 45° E. Find the true speed and direction of the jet.