MAT 122 Final Exam

Show all work for credit. Do all your work neatly on the paper provided. Write your name on each sheet you turn in. I will **not** grade any work done on the test sheet. When you are finished turn in all sheets including the test. Good Luck.

1. Fill in the following table:

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin\theta$					
$\cos\theta$					

2. Verify the following identities:
   (a) $\dfrac{1}{\sin x} - \sin x = \dfrac{\cos^2 x}{\sin x}$
   (b) $\cot^2 y(\sec^2 y - 1) = 1$
   (c) $\dfrac{1}{\sec x \tan x} = \csc x - \sin x$

3. For $\theta = \dfrac{7\pi}{6}$ do the following:
   (a) Find the quadrant in which θ lies.
   (b) Sketch the angle in standard position.
   (c) Find two coterminal angles for θ (one positive, one negative).
   (d) Find the reference angle.

4. Given $\cos\theta = \dfrac{3}{5}$ and $\cot\theta < 0$ find the exact values of the other 5 trigonometric functions of θ.

5. Graph $f(x) = \sin(2x - \dfrac{\pi}{4})$

6. Find all solutions of the equation $4\sin^2 x - 3 = 0$ in the interval $[0, 2\pi)$.

7. Solve the triangle given $a = 8$, $b = 3$, $c = 9$.

8. Given $\mathbf{u} =< -1, 3 >$ and $\mathbf{v} = 3\mathbf{i} + 2\mathbf{j}$ find each of the following:
   (a) $\mathbf{u} + \mathbf{v}$
   (b) The length of $\mathbf{u}$ and the length of $\mathbf{v}$.
   (c) A vector of length 7 in the direction of $\mathbf{u}$
   (d) The direction angle of $\mathbf{v}$
   (e) $\mathbf{u} \cdot \mathbf{v}$
   (f) Determine if $\mathbf{u}$ and $\mathbf{v}$ are orthogonal, parallel, or neither.
   (g) Find the projection of $\mathbf{u}$ onto $\mathbf{v}$ (what we called $\mathbf{w}_1$), and the vector component of $\mathbf{u}$ orthogonal to $\mathbf{v}$ (what we called $\mathbf{w}_2$).

9. When a plane leaves the runway, it angle of climb is $18°$ and its speed is 275 feet per second. Find the planes altitude after one minute.