By signing my name below, I agree that I am following all rules and regulations set forth by the Code of Academic Integrity. Furthermore, I agree that I am following all rules set by my instructor and by the course policy for this exam. This includes ensuring that all calculator programs except possibly EVALUATE and QUADRATIC FORMULA have been deleted.

Signature: ___________________________ Date: ___________________________

Section I – Multiple Choice

Circle the correct answer. No partial credit will be given.

1. 2.5 radians is equal to how many degrees?
   (A) $2.5 \times \frac{180}{\pi}$  
   (B) $2.5 \times \frac{180}{\pi}$  
   (C) $2.5 \times \frac{2\pi}{180}$  
   (D) $2.5 \times \frac{\pi}{180}$  
   (E) None of the above.

2. If $\cos \theta = \frac{t}{3}$ and $\pi < \theta < \frac{3\pi}{2}$ then $\sin \theta$ is equal to
   (A) $\frac{3}{t}$  
   (B) $-\frac{3}{t}$  
   (C) $\frac{1}{3} \sqrt{9 - t^2}$  
   (D) $-\frac{1}{3} \sqrt{9 - t^2}$  
   (E) None of the above.

3. Length-of-day statistics for Boston are provided below with the length of day in hours given as a function of the day of the year.

<table>
<thead>
<tr>
<th>Day $t$</th>
<th>15</th>
<th>46</th>
<th>75</th>
<th>106</th>
<th>136</th>
<th>167</th>
<th>197</th>
<th>228</th>
<th>259</th>
<th>289</th>
<th>320</th>
<th>350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length $y$</td>
<td>9</td>
<td>10</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>14</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

Assuming we want to use a sine or cosine function to represent this data, what should the amplitude and period of our function be?

(A) Amplitude 15, period 365.  
(B) Amplitude 3, period 365.  
(C) Amplitude 167.5, period 365.  
(D) Amplitude 15, period 12.  
(E) Amplitude 3, period 12.
Section II – Short Answer

Answer in the space provided. Show your work.

1. Convert the following expression into one involving only sines and cosines and then simplify as much as possible.

\[
\frac{\sin A + \cos A}{\sec A + \csc A}
\]

2. Using the unit circle definition, determine \( \sin(\pi/4) \). (No points will be awarded for using any other method, or just remembering the value).
3. Given the right-angled triangle below, evaluate $\sin \theta$.

4. Graph one period of $y = -2 \sin \left( x - \frac{\pi}{4} \right)$. Make sure to mark the $x$-intercepts and the maximum and minimum values.
5. The following graph shows one period of the graph of a function of the form $y = \tan(Bx - C)$. Determine $B$ and $C$. 

\[
\begin{align*}
&\ x = -\frac{\pi}{2} \\
&\ \pi/2 \\
&\ x = 3\pi/2
\end{align*}
\]
6. Give ALL solutions to \( \sin x = 1/2 \).

7. Prove the identity
\[
\sin 2\theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}.
\]
8. Find all solutions to \( \cos^2 \theta = \sin \theta \cos \theta \) with \( 0 \leq \theta < 2\pi \).