Physics 1145  Homework # 1: Math review, Unit Conversions, 1-d motion

1. Solve the system of equations for $A$:
   \[
   7A - 5B = -1 \\
   B + A = 5
   \]

2. Solve the system of equations for $C$:
   \[
   A + 3C = 9 \\
   5C - 2A = 4
   \]

3. Sketch the functions $\sin(x)$ and $\cos(x)$ for $0 \leq x \leq 2\pi$.

4. Fill in the table. Leave square roots of 2 and 3 exact. You should be able to do this without needing a calculator.

<table>
<thead>
<tr>
<th>$\theta$</th>
<th>$\sin \theta$</th>
<th>$\cos \theta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Two similar right triangles are perpendicular to one another, as shown in the figure at right. Express the length $L$ in terms of length $D$ and angle $\theta$.

![Diagram of two similar right triangles]

6. Two right triangles share a side of length $L$ as shown in the figure. Express the length $x$ in terms of $L$ and $\theta$.

![Diagram of two right triangles sharing a side]

7. Convert to SI units and express in scientific notation.
   
   a) 5 $\mu$s 
   b) 3.0g 
   c) 4.5 km 
   d) 80 km/hr 
   e) 60 mph 
   f) 4 in 
   g) 10 in$^2$ 
   h) 120 cm$^3$

8. A goose flies 20km south and then turns to fly 32km west. How far is the goose from its original position?

9. The figure shows position vs time graphs for two horses.
   
   a) Sketch velocity vs time graphs for each of the horses.
   
   b) Do the horses ever have the same speed? Where?
   
   c) Does horse A ever passes horse B? If so, indicate at which point in time.
   
   d) Does horse B ever passes horse A? If so, indicate at which point in time.

![Graphs showing position vs time for two horses]