Constant Acceleration Equations:

\[ v_2 = v_1 + a\Delta t \]
\[ s_2 = s_1 + \left( \frac{v_1 + v_2}{2} \right) \Delta t \]
\[ s_2 = s_1 + v_1 \Delta t + \frac{1}{2} a (\Delta t)^2 \]
\[ s_2 = s_1 + \frac{v_1^2 - v_2^2}{2a} \]
1. (4 pts) What is the number of significant digits in each of the following numbers?

<table>
<thead>
<tr>
<th>Number</th>
<th>Number of Significant Digits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.007</td>
<td>1</td>
</tr>
<tr>
<td>30.8</td>
<td>2</td>
</tr>
<tr>
<td>30.08</td>
<td>3</td>
</tr>
<tr>
<td>2.80</td>
<td>2</td>
</tr>
</tbody>
</table>

2. (4 pts) Find the x component of the vector.

\[
\begin{align*}
\text{120 ft} & \\
\text{40°} & \\
\end{align*}
\]

3. (4 pts) What is the magnitude of the displacement vector between \( S_1 \) and \( S_2 \)?

\[
S_1 = (-30\hat{i} - 7\hat{j})\text{ ft}, \quad S_2 = (-30\hat{i} + 20\hat{j})\text{ ft}
\]

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s_2 &= s_1 + \frac{v_2^2 - v_1^2}{2a}
\end{align*}
\]
4. (4 pts) What is the angle counterclockwise from the x-axis of vector $\mathbf{A}$?

$\mathbf{A} = (5\hat{i} - 22\hat{j}) \text{ ft/s}$

5. (6 pts) The volume of the Moon is about $21.9 \times 10^9$ cubic kilometers. What is the volume of a 1000 kilometers = 2 inch scale model? (State the answer in cubic inches).

\[ v_2 = v_1 + a\Delta t \quad s_2 = s_1 + \left(\frac{v_1 + v_2}{2}\right)\Delta t \quad s_2 = s_1 + v_1\Delta t + \frac{1}{2}a(\Delta t)^2 \quad s_2 = s_1 + \frac{v_2^2 - v_1^2}{2a} \]
6. (8 pts) The initial position of a remote control car is \((-15\hat{i} - 6\hat{j})\) m. If it starts from rest and has a constant acceleration of \((\hat{i} - 2\hat{j})\) m/s\(^2\), what is the final position after 10 seconds (\(\hat{i}, \hat{j}\) notation)?

7. (14 pts) The sum of the three vectors shown is zero. Vector B is horizontal. 

\[ |\vec{C}| = 15\text{m} \]

Determine the magnitude of vector B

---

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\end{align*}
\]
8. (14 pts) The four vectors acting are in equilibrium. Determine the magnitude of vector B.

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\[ s_2 = s_1 + \frac{v_2^2 - v_1^2}{2a} \]

9. (14 pts) Dr. Bennett, our absent minded professor, is riding his bicycle to class. On his first leg he starts from rest and accelerates at a constant rate of 0.8 m/s² for 12 seconds. Afterwards he gets tired and starts slowing down at a constant rate until he reaches class and comes to a stop. The second leg took him 50 seconds. How far did he ride?
10. (14 pts) An EF151 student is standing on the second floor of Estabrook Hall. He throws the ball up with an initial velocity of 30 ft/sec. The height of the second floor railing is 25 ft. How long does it take for the ball to hit the floor?

11. (14 pts) A car is driving at constant velocity of 70 ft/sec when it passes a police car that is sitting by the side of the road. The police car starts chasing the car the instant the car passes it, accelerating at a constant rate of 14 ft/s². How much time does it take for the police car to catch up with the speeding car?

Constant Acceleration Equations:

\[
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v_2 &= v_1 + a\Delta t \\
\Delta s &= v_1 \Delta t + \frac{1}{2} a (\Delta t)^2 \\
\end{align*}
\]