Instructions
Read today's [Notes and Learning Goals](https://www.webassign.net/v4cgijaimos@boisestate/assignments/preview.tpl?aid=6708554&deployment=10659018&UserPass=7b) before you start the assignment.

1. **Question Details**
   Fall 14 Deriv App 1 [3151004]

   The current in a circuit is given by \( i(t) = 300e^{-2.5t} \), where \( t \) is measured in seconds and \( i \) is measured in amperes (A). How fast is the current changing when \( t = 2 \) seconds? Be accurate to two decimal places and include correct units.

   \[ \frac{\text{d}i}{\text{d}t} \]

2. **Question Details**
   Fall 14 Deriv App 2 [3151005]

   An object is launched straight up. Its height is given by \( h(t) = 200t - 16.1t^2 \), where \( t \) is measured in seconds and \( h \) is measured in feet. What is its velocity at the instant when \( t = 8 \) seconds? Be accurate to one decimal place and include correct units.

   \[ \frac{\text{d}h}{\text{d}t} \]

3. **Question Details**
   Fall 14 Deriv App 3 [3151017]

   A frozen object is dropped into boiling water. Its temperature, \( T \), is measured at 0.5 minute intervals as shown in the table below. \( T \) is measured in kelvins (K) and time is in minutes.

<table>
<thead>
<tr>
<th>( T ) (K)</th>
<th>273.0</th>
<th>296.7</th>
<th>314.7</th>
<th>328.5</th>
<th>339.0</th>
<th>347.1</th>
<th>353.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t ) (min)</td>
<td>0.0</td>
<td>0.5</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
<td>2.5</td>
<td>3.0</td>
</tr>
</tbody>
</table>

   Estimate \( T'(1) \). Be accurate to the nearest integer and include correct units.

   \[ \text{Estimate } T'(1) \]
4. Question Details

Use the same temperature data from the last problem to estimate $T'(2.5)$, $T'(2.75)$, and $T'(3.0)$. Discuss your estimates with a study partner. Then answer the multiple-choice questions below.

<table>
<thead>
<tr>
<th>$T$ (K)</th>
<th>273.0</th>
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<th>314.7</th>
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<td>2.5</td>
<td>3.0</td>
</tr>
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</table>

Warning! Only two tries on each question. Compute. Discuss. Then submit.

Which of the following is the best estimate for $T'(2.5)$?
- $10$ K/min
- $12$ K/min
- $14$ K/min
- $16$ K/min

Which of the following is the best estimate for $T'(2.75)$?
- $10$ K/min
- $12$ K/min
- $14$ K/min
- $16$ K/min

Which of the following is the best estimate for $T'(3.0)$?
- $10$ K/min
- $12$ K/min
- $14$ K/min
- $16$ K/min

5. Question Details

The graph below shows the height of an object as a function of time. Height, $h$, is in meters and time, $t$, is in seconds.

Estimate the velocity of the object at the instant $t = 2$ seconds. Do NOT include units.
6. Question Details
The position of a moving object is given by \( s(t) = 2.1 \sin(\pi(t-0.2)) \), where \( t \) is measured in minutes and \( s \) is measured in feet. How fast is the position changing at the instant \( t = 1 \) minute? Be accurate to two decimal places and include units.

\[
\frac{ds}{dt} \bigg|_{t=1} \text{ ft/min}
\]

7. Question Details
An object is launched straight upwards. Its height is
\[
h(t) = 35t - 4.9t^2
\]
where \( h \) is in meters and \( t \) is in seconds. At what instant in time is its velocity exactly 25 m/s? Be accurate to two decimal places and include correct units.

\[
\frac{dh}{dt} = 25 \text{ m/s}
\]

8. Question Details
A skydiver’s height above ground is
\[
h(t) = 10850 - 170t - 850e^{-0.2t}
\]
where \( h \) is in feet and \( t \) is in seconds. At what instant in time is she falling at \(-120 \) feet per second? Be accurate to two decimal places and include correct units.

\[
\frac{dh}{dt} = -120 \text{ ft/s}
\]

9. Question Details
During a brief portion of an engine cycle, the pressure in a cylinder is a function of time:
\[
p(t) = -2500 + 350t + \frac{3000}{\sqrt{t}}, \quad 1 \leq t \leq 5
\]
where \( p \) is in kilopascals (kPa) and \( t \) is in milliseconds (ms). At what instant in time is the rate of change of pressure exactly 162.5 kPa/ms? Be accurate to two decimal places and include correct units.

\[
\frac{dp}{dt} = 162.5 \text{ kPa/ms}
\]

10. Question Details
A frozen object is dropped into boiling water. Its temperature, \( T \), is measured at 0.5 minute intervals as shown in the table below. \( T \) is measured in kelvins (K) and time is in minutes.

<table>
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<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
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Estimate the instant in time when temperature is changing at 24 K/min. Be accurate to the nearest half minute and include units.

Warning! To prevent random guesses of half-minute answers, you are allowed only two tries. Be careful with units.
The graph below shows the height of an object as a function of time, together with tangent lines located at $t = 2$ seconds and $t = 3$ seconds. Height, $h$, is in meters and time, $t$, is in seconds.

Use the information in the graph to answer these questions below.

**Warning!** To prevent random guesses you are allowed **only two** tries on each question. Be careful with units.

Estimate the instant in time when velocity is zero. Be accurate to the nearest second. Include units.

Estimate the instant in time when velocity is $-20$ m/s. Be accurate to the nearest second. Include units.

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An object is launched straight up. Its height is given by $h(t) = 10 + 30t - 4.9t^2$, where $t$ is measured in seconds and $h$ is measured in meters.

Graph this function on the domain $0 \leq t \leq 6$ seconds.

At what instant is the velocity zero? Be accurate to 3 decimal places and include units.

What is the maximum height attained by the object? Be accurate to 3 decimal places and include units.
An object is launched straight up. Its height is given by 
\[ h(t) = b + ct - 4.9t^2, \]
where \( t \) is measured in seconds and \( h \) is measured in meters, and \( b \) and \( c \) are constants.

Assume that the graph of this function looks very much like the graph from the previous problem.

At what instant is the velocity zero? Your answer may include either or both of \( b \) and \( c \).

What is the maximum height attained by the object? Your answer may include either or both of \( b \) and \( c \).

During a brief portion of an engine cycle, the pressure in a cylinder is a function of time:

\[ p(t) = -2500 + 350t + \frac{3000}{\sqrt{t}}, \quad 1 \leq t \leq 5 \]

where \( p \) is in kilopascals (kPa) and \( t \) is in milliseconds (ms).

Graph this function on the domain \( 1 \leq t \leq 5 \) milliseconds.

At what instant is the rate of change of pressure zero? Be accurate to 3 decimal places and include units.

What is the minimum pressure? Be accurate to 2 decimal places and include units.