Part 1 – Bungee Jump

For positive time t, $y(t) = -1200e^{-\frac{1}{10}t+\frac{3}{2}}\cos\left(\frac{1}{5}(t-18)\right)+5200$.

Take the derivative twice.

1. Enter the following command on the *Calculator* section on page 1.5:
$\textbf{solve}\left(\frac{\textbf{d}}{\textbf{dt}}(\textbf{y(t)})=\textbf{0},\textbf{t}\right)\textbf{|0<t<40}$. What is the significance of this result? (Note: notice the argument "**,t**" is needed and the "such that" symbol ("|") limits the domain.)

2. What physical quantity is given by the second derivative of position?

3. Within the first 40 seconds, when do (does) the extrema for the velocity occur? Show your work.

4. The third derivative of position with respect to time is known as *jerk*. After the first time the velocity is zero, when does jerk have the largest magnitude?

5. When is the downward velocity at a maximum? What is the speed at that time?

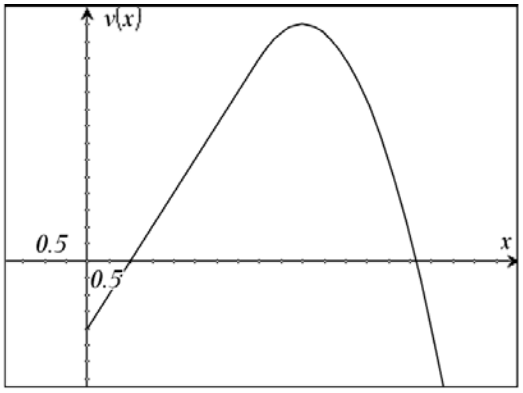
6. Write at least two complete sentences relating position-time, velocity-time, and acceleration-time graphs from the helicopter bungee jump situation.

7. After 4 seconds, what is the maximum number of g's. Use the graph to justify your answer.

8. What is the point of inflection where the graph changes from concave up to concave down in the first 40 seconds?

Part 2 – Graphically examine another situation

Let s be the function $s(t)=\int_0^t v(x)dx$.



9. $s(1)$ =

10. $s'(1)$ =

11. $s''(1)$ =

12. Use calculus to find when v is a maximum. Show your work.

13. For $0 < x < 7$, when is the graph of s concave up? Explain your reasoning.

14. For $0 < x < 7$, when is the graph of s decreasing? Explain your reasoning.