

MAT251 Quiz 2

1. The height of an object shot upward from a cannon is given by $f(t) = 16t^2 + 30t$, where f is in feet and t is in seconds. Using difference quotients,

Hint: for 1a-1c, do not use TABLE since it truncates values. Instead, work them out in your calculator's normal window and do not round or truncate any values. Include all decimal places. Include units in your answers.

- Find the average rate of change of the object when $t = 5$ seconds and $h = 0.1$ seconds. (2pts)
 - Find the average rate of change of the object when $t = 5$ seconds and $h = 0.01$ seconds. (2 pts)
 - Find the average rate of change of the object when $t = 5$ seconds and $h = 0.001$ seconds. (2 pts)
 - Use this trend to find the instantaneous rate of change of the object at $t = 5$ seconds. (2 pts)
2. Use the short form of the derivative formula to find the derivative of these functions.
- $f(x) = x^5 + 2x^3 - 5x^2 + 12$ (1 pt)
 - $g(x) = \frac{2}{3}\sqrt[5]{x^2}$ (Leave answer in a radical format) (1 pt)

KEY

- 1a. $\frac{f(5.1)-f(5)}{0.1} = \frac{569.16-550}{0.1} = \frac{19.16}{0.1} = 191.6 \frac{\text{ft}}{\text{s}}$
- 1b. $\frac{f(5.01)-f(5)}{0.01} = \frac{551.9016-550}{0.01} = \frac{1.9016}{0.01} = 190.16 \frac{\text{ft}}{\text{s}}$
- 1c. $\frac{f(5.001)-f(5)}{0.001} = \frac{550.190016-550}{0.001} = \frac{0.190016}{0.001} = 190.016 \frac{\text{ft}}{\text{s}}$
- 1d. 190 feet/sec.

2a. $f'(x) = 5x^4 + 6x^2 - 10x$

2b. Rewrite g as $g(x) = \frac{2}{3}x^{2/5}$, so $g'(x) = \frac{2}{3}\left(\frac{2}{5}x^{2/5-1}\right) = \frac{4}{15}x^{-3/5} = \frac{4}{15\sqrt[5]{x^3}}$