

Worksheet 2

1. Suppose that the position of an object is given by $y = t^2 - 6t + 12$.

(a) Find the position of the particle at $t = 3$, $t = 3.5$, and $t = 4$.

(b) Find the average velocity on $[3, 4]$

(c) Find the average velocity on $[3.5, 4]$

2. Find $f(t + h)$ for the function in problem (1).

3. Find $f(3 + h)$ for the function in problem (1).

4. Find $\lim_{h \rightarrow 0} \frac{f(3 + h) - f(3)}{h}$ for the function in problem 1.

5. Find $\lim_{h \rightarrow 0} \frac{f(a + h) - f(a)}{h}$ for the function in problem 1. The answer will depend on a .

6. Let $f(x) = x^2 - 12x$. Then $\lim_{x \rightarrow 6} f(x) = -36$. To prove this, find a δ such that

$$|x - 6| < \delta \implies |(x^2 - 12x) - (-36)| < \epsilon$$

The answer will depend upon ϵ . Then find a value of δ that works for $\epsilon = 0.01$.

7. Find what value of the constant c will $f(x) = \begin{cases} x^2 - c, & \text{if } x < 7 \\ cx + 7, & \text{if } x \geq 7 \end{cases}$ be continuous on $(-\infty, \infty)$.

8. Let $f(x) = 1/x^2$. Find $f'(5)$ using the definition of the derivative.

9. Let $f(x) = -2x^3 + 6x + 1$. Find $f'(x)$ and $f''(x)$ as a function of x using the definition of a derivative.