

Unit 1: Rates of Change Assessment of Learning

Instructions

There are 10 questions in this Assessment of Learning for a total of 60 marks.

Show all work for each question.

1. Determine the average rate of change of y in the function $y = 2x^3 + 7x^2 + 2x - 3$ over the interval $[3,5]$. **(5 marks)**

2. Given the function $f(x) = 2x^2 + 3x + 1$,

a. Find the instantaneous rate of change when $x = 1$. **(4 marks)**

b. Find the value of the derivative when $x = 1$. **(4 marks)**

c. What did you notice? **(1 mark)**

3. Explain the difference between a secant line and a tangent line. How do they relate to the rate of change of a function? Include a sketch of each type of line in your solution. **(6 marks)**

4. The path of a baseball relative to the ground can be modelled by the function $d(t) = -t^2 + 8t + 1$, where $d(t)$ represents the height of the ball in metres, and t represents time in seconds.

a. Find the average rate of change of the ball between 1 and 3 seconds. **(4 marks)**

b. Using the secant method, find the instantaneous rate of change at 2 seconds. **(8 marks)**

5. a. Evaluate $\lim_{x \rightarrow 2} (3x^3 + 7x - 16)$. **(2 marks)**

b. What is the meaning of this value? **(2 marks)**

6. Evaluate the following limits.

a. $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$ **(3 marks)**

b. $\lim_{x \rightarrow \infty} \frac{8x^3 - 5x^2 + 17}{6x^3 + 2x^2 - 4x}$ **(3 marks)**

c. $\lim_{h \rightarrow 0} \frac{\sqrt{49+h} - 7}{h}$ **(4 marks)**

d. $\lim_{y \rightarrow 2} \frac{y^3 - 8}{2y^2 - 7y + 12}$ **(2 marks)**

e. $\lim_{h \rightarrow 0} \frac{\frac{4}{2+h} - 2}{h}$ **(3 marks)**

7. Find the slope of the tangent line at point $(-2,2)$ on the curve $f(x) = 2x^2 + 3x$. **(4 marks)**
8. Find the derivative of the function $f(x) = x^2 - 10x + 3$ using First Principles. **(4 marks)**
9. Find the equation of the tangent line at point $(2,2)$ on the curve $f(x) = x^2 - 7x + 12$. **(5 marks)**
10. At what point on the parabola $y = 3x^2 + 2x$ is the tangent line parallel to the line $y = 10x - 2$? **(6 marks)**