# Module: Calculus 1

## Practice Questions

### Question 1

Given the data in the table, find the average rate of change of the function $g(t)$ on the following intervals.

| $t$ | $g(t)$ |
|---|---|
| 0 | 1 |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 14 |
| 5 | 20 |
| 6 | 28 |
| 7 | 37 |
| 8 | 49 |

a. $0 \leq t \leq 2$

**Show solution**

b. $0 \leq t \leq 4$

**Show solution**

c. $4 \leq t \leq 7$

**Show solution**

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### Question 2

Use rates of change to estimate the instantaneous velocity of a moving object at time $t = 3$ s if the position of the object is given by the function $s(t) = 4t^2 - 2t + 1$ (in m).

- **Show solution**

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## Question 3

Find the limits of the sequences.

a. $1, \frac{5}{2}, \frac{5}{3}, \frac{9}{4}, \frac{9}{5}, \frac{13}{6}, \frac{13}{7}, \ldots, 2 + \frac{(-1)^n}{n}, \ldots$

**Show solution**

b. $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \ldots, 3^{1-n}, \ldots$

**Show solution**

c. $0.6, 0.66, 0.666, 0.6666, 0.66666, \ldots$

**Show solution**

d. $1, -2, 3, -4, 5, -6, \ldots, (-1)^{n-1}n, \ldots$

**Show solution**

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## Question 4

Find the limits.

a. $\lim_{x \to -2} x^2 + 3x - 7$

**Show solution**

b. $\lim_{x \to 3} \dfrac{x^2 + 1}{x + 7}$

**Show solution**

c. $\lim_{x \to 1} \sqrt{\dfrac{x + 2}{x^2 + 4}}$

**Show solution**

d. $\lim_{x \to 0} \dfrac{2x^2 - 5x + 2}{\sqrt{x + 4}}$

**Show solution**

## Question 5

Consider the function

$$f(x) = \begin{cases} x + 4 & x < -2 \\ 2 & -2 \le x < 1 \\ 1 - x^2 & 1 \le x < 3 \\ 1 & x \ge 3 \end{cases}.$$

Determine if the function has any discontinuities. If so, what type(s)?

- $\lim_{x \to -2} x^2 + 3x - 7$

**Show solution**

## Question 6

Consider $g(x) = \dfrac{x^2 - 4}{x - 2}$.

a. Is $g(x)$ defined for $x = 2$?

**Show solution**

b. Is $g(x)$ continuous at $x = 2$?

**Show solution**

c. Does $\lim\limits_{x \to 2} g(x)$ exist?

**Show solution**

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## Question 7

Find the limits.

a. $\lim\limits_{x \to 0} \dfrac{2x^2 + 3x}{x + x^2}$

**Show solution**

b. $\lim\limits_{x \to 9} \dfrac{\sqrt{x} - 3}{9 - x}$

**Show solution**

c. Does $\lim\limits_{x \to 4} \dfrac{\frac{1}{4} - \frac{1}{x}}{4 - x}$

**Show solution**

d. $\lim_{x \to 3} \dfrac{x^3 - 27}{x - 3}$

**Show solution**

## Question 8

What is the derivative of $f(x) = \sqrt{x} = x^{1/2}$?

- **Show solution**

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## Question 9

If a moving object has position function $s(t) = 4t^2 + 2t$ (in m), what is the velocity at time $t = 5$ s?

- **Show solution**

## Question 10

What is the equation of the tangent line to the curve $y = \dfrac{1}{x^2}$ at the point (1, 1)?

- **Show solution**

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