

Math Sheet

Name _____ Score _____ / 8 Teacher _____ Date _____

Average Rate of Change

Find the average rate between inputs x and a . Simplify exactly; retain the original restrictions.

1. $f(x) = (-2x + 3)(-2x - 6)$

2. $f(x) = -x^4 + 1$

3. $f(x) = \frac{4x}{-x - 3}$

4. $f(x) = -2x^2 - x - 1$

5. $f(x) = \frac{1}{x - 5}$

6. $f(x) = -4x^3 + 6x^2 + 6x - 6$

7. $f(x) = 5x + 3$

8. $f(x) = (-x - 4)^2 - x$

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Average Rate of Change

Worked answer key

Find the average rate between inputs x and a. Simplify exactly; retain the original restrictions.

1. $f(x) = (-2 \cdot x + 3)(-2 \cdot x - 6)$

Substitute:
$$\frac{(-2 \cdot x + 3)(-2 \cdot x - 6) - (-2 \cdot a + 3)(-2 \cdot a - 6)}{x - a}$$

$$= \frac{(x - a)(4 \cdot x + 4 \cdot a + 6)}{x - a}$$

Simplify: $4 \cdot x + 4 \cdot a + 6$

Restrictions: $x - a \neq 0$

2. $f(x) = -x^4 + 1$

Substitute:
$$\frac{-x^4 + 1 - (-a^4 + 1)}{x - a}$$

$$= \frac{(x - a)(-x^3 - x^2 \cdot a - x \cdot a^2 - a^3)}{x - a}$$

Simplify: $-x^3 - x^2 \cdot a - x \cdot a^2 - a^3$

Restrictions: $x - a \neq 0$

3. $f(x) = \frac{4 \cdot x}{-x - 3}$

Substitute:
$$\frac{\frac{4 \cdot x}{-x - 3} - \frac{4 \cdot a}{-a - 3}}{x - a}$$

$$= \frac{-12(x - a)}{(-x - 3)(-a - 3)(x - a)}$$

Simplify:
$$\frac{-12}{(x + 3)(a + 3)}$$

Restrictions: $x - a \neq 0, -x - 3 \neq 0, -a - 3 \neq 0$

4. $f(x) = -2 \cdot x^2 - x - 1$

Substitute:
$$\frac{-2 \cdot x^2 - x - 1 - (-2 \cdot a^2 - a - 1)}{x - a}$$

$$= \frac{(x - a)(-2 \cdot x - 2 \cdot a - 1)}{x - a}$$

Simplify: $-2 \cdot x - 2 \cdot a - 1$

Restrictions: $x - a \neq 0$

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Worked answer key

Find the average rate between inputs x and a. Simplify exactly; retain the original restrictions.

5. $f(x) = \frac{1}{x-5}$

Substitute: $\frac{\frac{1}{x-5} - \frac{1}{a-5}}{x-a}$

$= \frac{-\left(\frac{1}{x-5} - \frac{1}{a-5}\right)}{(x-5)(a-5)(x-a)}$

Simplify: $\frac{-1}{(x-5)(a-5)}$

Restrictions: $x-a \neq 0, x-5 \neq 0, a-5 \neq 0$

6. $f(x) = -4x^3 + 6x^2 + 6x - 6$

Substitute: $\frac{-4x^3 + 6x^2 + 6x - 6 - (-4a^3 + 6a^2 + 6a - 6)}{x-a}$

$= \frac{(x-a)(-4x^2 - 4x \cdot a - 4a^2 + 6x + 6a + 6)}{x-a}$

Simplify: $-4x^2 - 4x \cdot a - 4a^2 + 6x + 6a + 6$

Restrictions: $x-a \neq 0$

7. $f(x) = 5x + 3$

Substitute: $\frac{5x + 3 - (5a + 3)}{x-a}$

$= \frac{(x-a) \cdot 5}{x-a}$

Simplify: 5

Restrictions: $x-a \neq 0$

8. $f(x) = (-x-4)^2 - x$

Substitute: $\frac{(-x-4)^2 - x - (-a-4)^2 - a}{x-a}$

$= \frac{(x-a)(-x^2 - x \cdot a - a^2 - 8x - 8a - 16)}{x-a}$

Simplify: $-x^2 - x \cdot a - a^2 - 8x - 8a - 16$

Restrictions: $x-a \neq 0$