Derivatives Using a Table of Values

Calculus Worksheet · Grade 11-12

Name: ______________________________ Date: _______________ Score: / 10

Learning Objectives

- Apply the sum, difference, product, and quotient rules to find derivatives of combined functions
- Evaluate derivatives at specific values using a given table of function and derivative values
- Interpret tabular data to compute h'(x) for composite expressions involving f(x) and g(x)

Use the table of values below to evaluate each derivative expression at the indicated point, showing the derivative rule applied in each step.

1. Given h(x) = f(x) + 3g(x), find h'(-2) using the table of values.

$$h(x) = f(x) + 3g(x), \quad h'(-2) = ?$$

Answer: ________________________________

2. Given h(x) = f(x) + g(x), find h'(1) using the table of values.

$$h(x) = f(x) + g(x), \quad h'(1) = ?$$

Answer: ________________________________

3. Given h(x) = f(x) \cdot g(x), find h'(0) using the product rule and the table of values.

$$h(x) = f(x)\,g(x), \quad h'(0) = ?$$

Answer: ________________________________

4. Given h(x) = \dfrac{f(x)}{g(x)}, find h'(2) using the quotient rule and the table of values.

$$h(x) = \frac{f(x)}{g(x)}, \quad h'(2) = ?$$

Answer: ________________________________

5. Given h(x) = 5f(x) - 2g(x), find h'(-1) using the table of values.

$$h(x) = 5f(x) - 2g(x), \quad h'(-1) = ?$$

Answer: ________________________________

6. Given h(x) = f(x) \cdot g(x), find h'(1) using the product rule and the table of values.

$$h(x) = f(x)\,g(x), \quad h'(1) = ?$$

Answer: ________________________________

7. Given h(x) = \dfrac{g(x)}{f(x)}, find h'(-2) using the quotient rule and the table of values.

$$h(x) = \frac{g(x)}{f(x)}, \quad h'(-2) = ?$$

Answer: ______________________________________

8. Given h(x) = 4f(x) + g(x), find h'(2) using the table of values.

$$h(x) = 4f(x) + g(x), \quad h'(2) = ?$$

Answer: ______________________________________

9. Given h(x) = f(x) \cdot g(x), find h'(-1) using the product rule and the table of values.

$$h(x) = f(x)\,g(x), \quad h'(-1) = ?$$

Answer: ______________________________________

10. Given h(x) = \dfrac{f(x)}{g(x)}, find h'(1) using the quotient rule and the table of values.

$$h(x) = \frac{f(x)}{g(x)}, \quad h'(1) = ?$$

Answer: ______________________________________

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ANSWER KEY & SOLUTIONS

Provide students with the reference table: x = -2, -1, 0, 1, 2 with f(x) = 3, 2, -1, 4, 0; f'(x) = 1, -2, 5, -3, 6; g(x) = -4, 1, 2, 5, 7; g'(x) = 8, 4, -1, 6, 2.

Solutions

1. Given h(x) = f(x) + 3g(x), find h'(-2) using the table of values.

$$h(x) = f(x) + 3g(x), \quad h'(-2) = ?$$

→ *Differentiate using the sum and constant multiple rules to get h'(x) = f'(x) + 3g'(x).*
→ *Substitute x = -2 to obtain h'(-2) = f'(-2) + 3g'(-2).*
→ *From the table, f'(-2) = 1 and g'(-2) = 8.*
→ *Compute h'(-2) = 1 + 3(8) = 1 + 24 = 25.*

Answer: $h'(-2) = 25$

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2. Given h(x) = f(x) + g(x), find h'(1) using the table of values.

$$h(x) = f(x) + g(x), \quad h'(1) = ?$$

→ *Apply the sum rule to get h'(x) = f'(x) + g'(x).*
→ *Substitute x = 1 to obtain h'(1) = f'(1) + g'(1).*
→ *From the table, f'(1) = -3 and g'(1) = 6.*
→ *Compute h'(1) = -3 + 6 = 3.*

Answer: $h'(1) = 3$

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3. Given h(x) = f(x) \cdot g(x), find h'(0) using the product rule and the table of values.

$$h(x) = f(x)\,g(x), \quad h'(0) = ?$$

→ *Apply the product rule: h'(x) = f'(x)g(x) + f(x)g'(x).*
→ *Substitute x = 0 to get h'(0) = f'(0)g(0) + f(0)g'(0).*
→ *From the table, f(0) = -1, f'(0) = 5, g(0) = 2, and g'(0) = -1.*
→ *Compute h'(0) = (5)(2) + (-1)(-1) = 10 + 1 = 11.*

Answer: $h'(0) = 11$

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4. Given h(x) = \dfrac{f(x)}{g(x)}, find h'(2) using the quotient rule and the table of values.

$$h(x) = \frac{f(x)}{g(x)}, \quad h'(2) = ?$$

→ *Apply the quotient rule: h'(x) = (f'(x)g(x) - f(x)g'(x)) / (g(x))^2.*
→ *Substitute x = 2 to get h'(2) = (f'(2)g(2) - f(2)g'(2)) / (g(2))^2.*
→ *From the table, f(2) = 0, f'(2) = 6, g(2) = 7, and g'(2) = 2.*
→ *Compute h'(2) = ((6)(7) - (0)(2)) / (7)^2 = 42 / 49 = 6/7.*

Answer: $h'(2) = \frac{42}{49} = \frac{6}{7}$

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5. Given h(x) = 5f(x) - 2g(x), find h'(-1) using the table of values.

$$h(x) = 5f(x) - 2g(x), \quad h'(-1) = ?$$

→ *Apply constant multiple and difference rules to get h'(x) = 5f'(x) - 2g'(x).*
→ *Substitute x = -1 to obtain h'(-1) = 5f'(-1) - 2g'(-1).*
→ *From the table, f'(-1) = -2 and g'(-1) = 4.*
→ *Compute h'(-1) = 5(-2) - 2(4) = -10 - 8 = -18.*

Answer: $h'(-1) = -18$

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6. Given h(x) = f(x) \cdot g(x), find h'(1) using the product rule and the table of values.

$$h(x) = f(x)\,g(x), \quad h'(1) = ?$$

→ *Apply the product rule: h'(x) = f'(x)g(x) + f(x)g'(x).*
→ *Substitute x = 1 to get h'(1) = f'(1)g(1) + f(1)g'(1).*
→ *From the table, f(1) = 4, f'(1) = -3, g(1) = 5, and g'(1) = 6.*
→ *Compute h'(1) = (-3)(5) + (4)(6) = -15 + 24 = 9.*

Answer: $h'(1) = 9$

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7. Given h(x) = \dfrac{g(x)}{f(x)}, find h'(-2) using the quotient rule and the table of values.

$$h(x) = \frac{g(x)}{f(x)}, \quad h'(-2) = ?$$

→ *Apply the quotient rule: h'(x) = (g'(x)f(x) - g(x)f'(x)) / (f(x))^2.*
→ *Substitute x = -2 to get h'(-2) = (g'(-2)f(-2) - g(-2)f'(-2)) / (f(-2))^2.*
→ *From the table, f(-2) = 3, f'(-2) = 1, g(-2) = -4, and g'(-2) = 8.*
→ *Compute h'(-2) = ((8)(3) - (-4)(1)) / (3)^2 = (24 + 4) / 9 = 28/9.*

Answer: $h'(-2) = \frac{28}{9}$

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8. Given h(x) = 4f(x) + g(x), find h'(2) using the table of values.

$$h(x) = 4f(x) + g(x), \quad h'(2) = ?$$

→ *Apply constant multiple and sum rules to get h'(x) = 4f'(x) + g'(x).*
→ *Substitute x = 2 to obtain h'(2) = 4f'(2) + g'(2).*
→ *From the table, f'(2) = 6 and g'(2) = 2.*
→ *Compute h'(2) = 4(6) + 2 = 24 + 2 = 26.*

Answer: $h'(2) = 26$

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9. Given h(x) = f(x) \cdot g(x), find h'(-1) using the product rule and the table of values.

$$h(x) = f(x)\,g(x), \quad h'(-1) = ?$$

→ *Apply the product rule: h'(x) = f'(x)g(x) + f(x)g'(x).*
→ *Substitute x = -1 to get h'(-1) = f'(-1)g(-1) + f(-1)g'(-1).*
→ *From the table, f(-1) = 2, f'(-1) = -2, g(-1) = 1, and g'(-1) = 4.*
→ *Compute h'(-1) = (-2)(1) + (2)(4) = -2 + 8 = 6.*

Answer: $h'(-1) = 6$

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10. Given h(x) = \dfrac{f(x)}{g(x)}, find h'(1) using the quotient rule and the table of values.

$$h(x) = \frac{f(x)}{g(x)}, \quad h'(1) = ?$$

→ *Apply the quotient rule: h'(x) = (f'(x)g(x) - f(x)g'(x)) / (g(x))^2.*
→ *Substitute x = 1 to get h'(1) = (f'(1)g(1) - f(1)g'(1)) / (g(1))^2.*
→ *From the table, f(1) = 4, f'(1) = -3, g(1) = 5, and g'(1) = 6.*
→ *Compute h'(1) = ((-3)(5) - (4)(6)) / (5)^2 = (-15 - 24) / 25 = -39/25.*

Answer: $h'(1) = -\frac{39}{25}$