Calculus 1 Workbook

Derivative rules

krista king
MATH

POWER RULE

- 1. Find the derivative of $f(x) = 7x^3 - 17x^2 + 51x - 25$ using the power rule.

- 2. Find the derivative of $g(x) = 2x^4 + 8x^3 + 6x^2 - 32x + 16$ using the power rule.

- 3. Find the derivative of $h(x) = 22x^3 - 19x^2 + 13x - 17$ using the power rule.

- 4. Find the derivative of $h(s) = s^4 - s^3 + 3s - 7$ using the power rule.

- 5. Find the derivative using the power rule.

$$g(t) = \frac{2}{3}t^3 - \frac{5}{2}t^6$$

- 6. Find the derivative of $f(x) = 20x^{100} + 5x^{21} - 3x - 1$ using the power rule.

POWER RULE FOR NEGATIVE POWERS

1. Find the derivative of the function using the power rule.

$$f(x) = \frac{7}{x^2} - \frac{5}{x^4} + \frac{2}{x}$$

2. Find the derivative of the function using the power rule.

$$g(x) = \frac{1}{9x^4} + \frac{2}{3x^5} - \frac{1}{x}$$

3. Find the derivative of the function using the power rule.

$$h(x) = -\frac{7}{6x^6} - \frac{1}{4x^4} + \frac{9}{2x^2}$$

4. Find the derivative of the function using the power rule.

$$g(x) = \frac{3}{x^2} + \frac{3}{2x^4} + \frac{1}{2}$$

5. Find the derivative of the function using the power rule.

$$f(x) = -2x^{-4} + \frac{1}{x^2} + 7x$$

6. Find the derivative of the function using the power rule, if a, b, and c are constants.

$$f(x) = 2ax^{-3a} + \frac{b}{cx^{2c}} - 2a$$

POWER RULE FOR FRACTIONAL POWERS

1. Find the derivative of the function using the power rule.

$$f(x) = 4x^{\frac{3}{2}} - 6x^{\frac{5}{3}}$$

2. Find the derivative of the function using the power rule.

$$g(x) = 6x^{\sqrt{3}} - 4x^{\sqrt{5}}$$

3. Find the derivative of the function using the power rule.

$$h(x) = \frac{1}{3}x^{\frac{6}{5}} + \frac{1}{4}x^{\frac{8}{3}} - \frac{1}{5}x^{\frac{5}{2}}$$

4. Find the derivative of the function using the power rule.

$$h(x) = \sqrt{x} + 2\sqrt[3]{x} - 3\sqrt[5]{x^2}$$

5. Find the derivative of the function using the power rule.

$$f(z) = \frac{3}{\sqrt{z^5}} + \frac{5}{4z^4} - 2z^{-2}$$

6. Find the derivative of the function using the power rule.

$$h(t) = \frac{2}{3t^6} + \frac{t^4}{4} - 9t^3 + \sqrt{t^3} + \frac{1}{2\sqrt[3]{t^2}}$$

PRODUCT RULE WITH TWO FUNCTIONS

■ 1. Use the product rule to find the derivative of the function.

$$h(x) = (3x + 5)(2x^2 - 3x + 1)$$

■ 2. Use the product rule to find the derivative of the function.

$$h(x) = 8x^3\sqrt[3]{x^2}$$

■ 3. Use the product rule to find the derivative of the function.

$$h(x) = (5x^2 - x)\left(\frac{1}{x^4} - 6\right)$$

■ 4. Use the product rule to find the derivative of the function.

$$h(x) = (1 + \sqrt{x^3})(x^{-2} - 3\sqrt[3]{x})$$

■ 5. If $f(3) = -4$, $f'(3) = 2$, $g(3) = -1$, and $g'(3) = 3$, determine the value of $(fg)'(3)$.

6. If $h(x) = 2x^3g(x)$, $g(-4) = -5$, and $g'(-4) = 1$, determine the value of $h'(-4)$.

PRODUCT RULE WITH THREE OR MORE FUNCTIONS

■ 1. Use the product rule to find the derivative of the function.

$$y = 5x^4(2x - x^2)\left(\frac{1}{x^2} - 5\right)$$

■ 2. Use the product rule to find the derivative of the function.

$$y = 30\left(\frac{1}{x^3} + x^2\right)(2x^4 - x^2 - x)$$

■ 3. Use the product rule to find the derivative of the function.

$$y = (x^2 - 3x + 5)(7 + 2x - 5x^2)(2 - 2\sqrt{x})$$

■ 4. Use the product rule to find the derivative of the function.

$$y = \left(x - \frac{3}{x}\right)(x^2 + 4x)(7x^4)\left(-5x^2 - \frac{1}{2}\right)$$

■ 5. Use $f(-2) = 5$, $f'(-2) = -7$, $g(-2) = -8$, $g'(-2) = -3$, $h(-2) = 1$ and $h'(-2) = 0$ to determine the value of $(fgh)'(-2)$.

6. Use $f(5) = 4$, $f'(5) = 2$, $g(5) = -2$, $g'(5) = 3$, $h(5) = -3$, and $h'(5) = -8$ if $y = [x^2 - f(x)]g(x)h(x)$, to determine the value of $y'(5)$.

QUOTIENT RULE

■ 1. Use the quotient rule to find the derivative of the function.

$$h(x) = \frac{2x + 6}{7x + 5}$$

■ 2. Use the quotient rule to find the derivative of the function.

$$h(x) = \frac{\sqrt[3]{x}}{1 + 2x^2}$$

■ 3. Use the quotient rule to find the derivative of the function.

$$h(x) = \frac{-8x}{5x + 2}$$

■ 4. Use the quotient rule to find the derivative of the function.

$$h(x) = \frac{2 - 4x + 5x^2}{5x + x^3}$$

■ 5. Use the quotient rule to find the derivative of the function.

$$k(x) = \frac{(2-3x)(1+x)}{2+3x^2}$$

■ 6. Use $f(5) = 4$, $f'(5) = 2$, $g(5) = -2$, $g'(5) = 3$, $h(5) = -3$, and $h'(5) = -8$ to determine the value of $k'(5)$.

$$k'(5) = \left(\frac{fg}{h}\right)'(5)$$

TRIGONOMETRIC DERIVATIVES

■ 1. Find $f'(x)$ if $f(x) = 3x^{-4} + x^2 \cot x$.

■ 2. Find $h'(x)$.

$$h(x) = \frac{\sin x}{5 - 2\cos x}$$

■ 3. Find $h'(x)$ if $h(x) = 3 \sin x \cos x + 5 \sec x$.

■ 4. Find the derivative of the trigonometric function.

$$y = 3 - 2\sqrt{x} \csc x$$

■ 5. Find the derivative of the trigonometric function.

$$y = \frac{2}{4\cos(x^2) - 5\sin(3x)}$$

■ 6. Find the derivative of y.

$$y = 2x^4 + \frac{x \tan x}{x^2 + 1}$$

EXPONENTIAL DERIVATIVES

■ 1. Find $f'(x)$ if $f(x) = (x^3 - x)e^x$.

■ 2. Find $g'(x)$ if $g(x) = 5^x(x^2 - 7x + 1)$.

■ 3. Find $h'(x)$ if $h(x) = \sin xe^x - x^2 \cos x$.

■ 4. Find $f'(x)$.

$$f(x) = \frac{4e^x}{3e^x - 1}$$

■ 5. Find $g'(x)$ if $g(x) = 8^x + 3e^x \cot x$.

■ 6. Find $h'(x)$ if $h(x) = \dfrac{x^3e^x}{x + 3^x}$.

LOGARITHMIC DERIVATIVES

■ 1. Find $f'(x)$.

$$f(x) = 2\log_5 x - 11\log_{13} x$$

■ 2. Find $g'(x)$.

$$g(x) = \log_4 x - x^6 \ln x$$

■ 3. Find $h'(x)$.

$$h(x) = \log_7 x \ln x$$

■ 4. Find $y'(x)$.

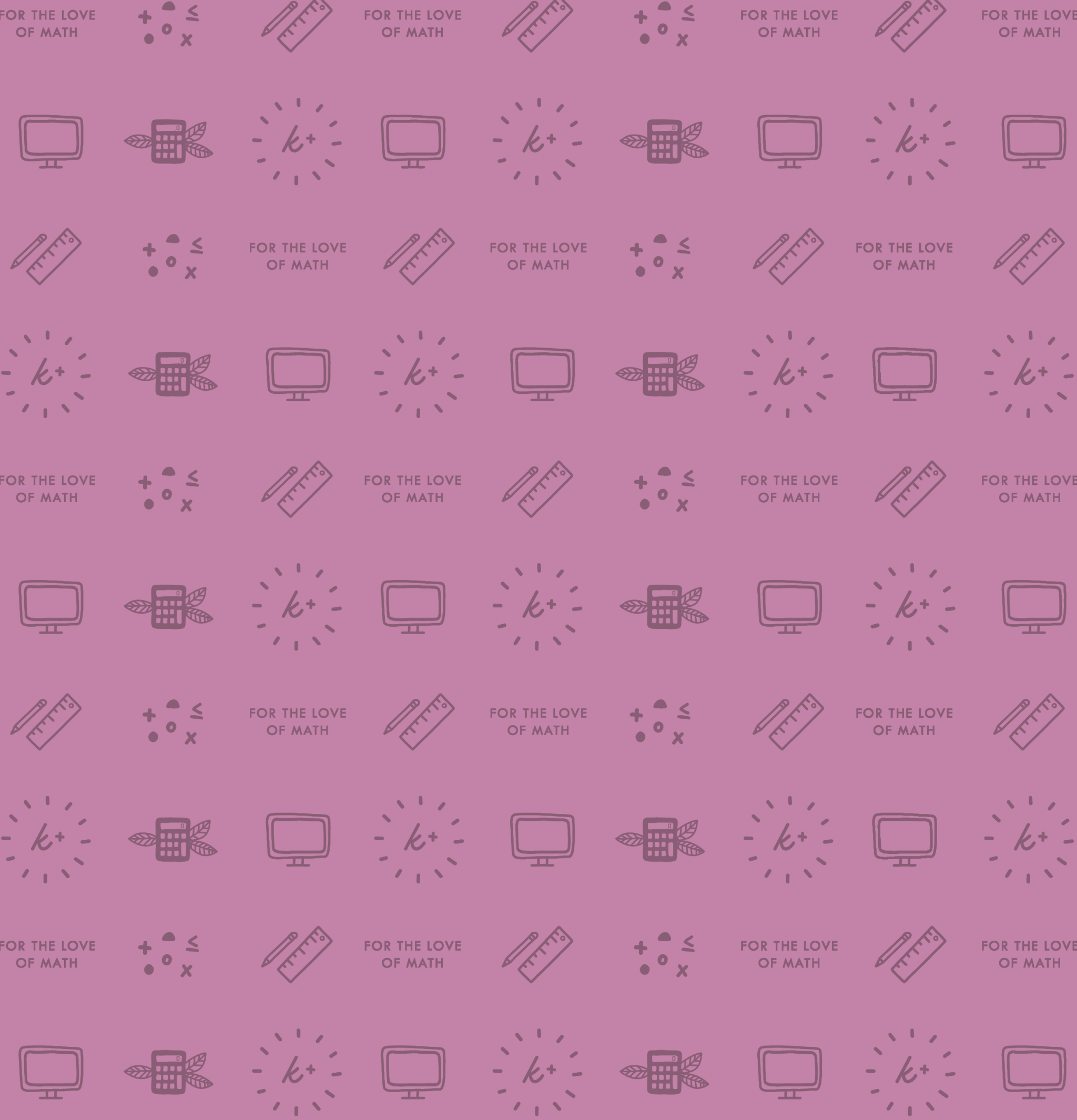
$$y = \frac{1 + 7\ln x}{6x^4}$$

■ 5. Find $y'(x)$.

$$y = \frac{x^3 + \log_5 x}{5^x}$$

6. Find $y'(x)$.

$$y = \frac{x^7 e^x}{\ln x}$$


FOR THE LOVE
OF MATH