MCV 4U

THE PRODUCT RULE & THE QUOTIENT RULE

PRODUCT RULE: If $H(x) = f(x) \cdot g(x)$, then $H'(x) = f(x)g'(x) + g(x)f'(x)$

EXERCISE: Determine the derivative using the product rule.

1. $y = 4x^2(2x+3)$

$f = 4x^2 \qquad f' = 8x$

$g = (2x+3) \qquad g' = 2$

$\frac{dy}{dx} = 4x^2(2) + 8x(2x+3)$

$= 24x^2 + 24x$

2. $g(x) = (x-2)^2(3x+2)^3$

$f = (x-2)^2 \qquad f' = 2(x-2)$

$g = (3x+2)^3 \qquad g' = 3(3x+2)^2[3]$

$\frac{dy}{dx} = 9(x-2)^2(3x+2)^2 + 2(x-2)(3x+2)^3$

$= (x-2)(3x+2)^2[9(x-2) + 2(3x+2)]$

$= (x-2)(3x+2)^2[15x-7]$

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

4. $H(t) = 3t^{0.3}\,(4t^2-3)^{2.8}$

5. $f(x) = 2\sqrt{x}\,(6-x)^2$

6. $s(t) = -2t^{\pi}\,\sqrt[4]{2t-1}$

7. $f(x) = \sqrt[3]{1-6x}\,(x-1)^2$

8. $y = \sqrt{x+k}\,(2kx+k);\ k\ is\ constant$

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

10. $SA = 2\pi r^2 + 2\pi r\sqrt{16-r^2}$

CHANGE EACH QUOTIENT INTO A PRODUCT & APPLY THE PRODUCT RULE

1. $f(x) = \frac{3x+2}{x}$

2. $f(x) = \frac{2x}{x-3}$ At what values of x is the slope of the tangent equal to -2?

3. $g(x) = \frac{3x^2}{2x-5}$ Determine the location of horizontal tangents.

4. $y = \frac{2x}{x^2-4}$ Determine the location of horizontal tangents.

5. $f(x) = \frac{4x}{x^2+4}$ Determine the location of horizontal tangents.

6. $C(t) = \frac{10t}{t^2+3}$ represents the concentration (mg/L) of a drug in the bloodstream, where t is the time in hours.

   A) What is the concentration of the drug in the bloodstream after 1 hour?
   B) When does the concentration reach 0.1 mg/L?
   C) What the rate of change in the concentration of the drug after 1 hour?
   D) When does the concentration reach its maximum in the bloodstream?

7. $y = \frac{x^2}{\sqrt{x^2-4}}$ Find the location of any local extrema.

8. $f(x) = \frac{x^2-4}{x^2+1}$ Find the location of any local extrema.

9. $f(x) = \frac{2\sqrt{x}}{x+2}$ Find the location of any local extrema.

10. $y = \frac{6\sqrt[3]{x^2-1}}{2x-3}$ Find the location of any local extrema.