C12 - 2.5 - Poly/Root Derivatives Notes

$y = 9$
$y' = 0$
$y = 3^2$
$y' = 0$

$y = 2$
$y = 2x^0$
$y' = 0 \times 2x^{-1}$
$y' = 0$

$y = 3x$
$y' = 3$

$y = mx + b$

$y = 3x^1$
$y' = 1 \times 3x^0$
$y' = 3$

$y = 3x + 2x$
$y = 5x$
$y' = 5$

$y = 3x + 2x$
$y' = 3 + 2$
$y' = 5$

$y = -2x + 1$
$y' = -2$

$y = x^2$
$y' = 2x^{2-1}$
$y' = 2x$

Leibniz

$y = x^3$
$\frac{dy}{dx} = 3x^{3-1}$
$\frac{dy}{dx} = 3x^2$

Power Rule

$f(x) = 2x^3$
$f'(x) = 3 \times 2x^{3-1}$
$f'(x) = 6x^2$

$y = \frac{x^2}{3}$
$y' = \frac{1}{3}(2x^1)$
$y' = \frac{2}{3}x$

$y = \frac{1}{x^2}$
$y = x^{-2}$
$y' = -2x^{-3}$
$y' = \frac{-2}{x^3}$

$y = \frac{1}{x}$
$y = x^{-1}$
$y' = -1x^{-2}$
$y' = \frac{-1}{x^2}$

$y = \sqrt{x}$
$y = x^{\frac{1}{2}}$
$y' = \frac{1x^{-\frac{1}{2}}}{2}$
$y' = \frac{1}{2x^{\frac{1}{2}}}$
$y' = \frac{1}{2\sqrt{x}}$

$y = x^{\frac{1}{2}}$
$y' = \frac{1\cancel{x^{-\frac{1}{2}}}}{2\sqrt{x}}$

$y = x^{\frac{3}{2}}$
$y' = \frac{3}{2}x^{\frac{1}{2}}$

Step 1
Over
Use less space

$y = x^4$
$y' = 4x^3$
$y'' = 12x^2$
$y''' = 24x$

$y = position$
$y' = velocity$
$y'' = accelleration$
$y''' = jerk$

Product Rule

$y = (2x + 1)(3x - 2)$
$y = 6x^2 - x - 2$
$y' = 12x - 1$

FOIL

Circle your Products*

$y = (2x + 1)(3x - 2)$
$y' = 2(3x - 2) + 3(2x + 1)$
$y' = 6x - 4 + 6x + 3$
$y' = 12x - 1$

$u = 2x + 1$
$u' = 2$

$v = 3x - 2$
$v' = 3$

$y = uv$
$y' = u'v + v'u$

$-3x(x^2 + 1)$

$-3x(x^2 + 1)$
$-3(x^2 + 1) + 2x(-3x)$
$-3x(x^2 + 1)$
$-(3(x^2 + 1) + 2x(3x))$
$-3x(x^2 + 1)$
$-3(1(x^2 + 1) + 2x(x))$

Quotient Rule

$y = \frac{x^2}{2x + 1}$
$y' = \frac{2x(2x + 1) - 2(x^2)}{(2x + 1)^2}$
$y' = \frac{4x^2 + 2x - 2x^2}{(2x + 1)^2}$
$y' = \frac{2x^2 + 2x}{(2x + 1)^2}$
$y' = \frac{2x(x + 1)}{(2x + 1)^2}$

$u = x^2$
$u' = 2x$

$v = 2x + 1$
$v' = 2$

$y = \frac{u}{v}$
$y = \frac{u'v - v'u}{v^2}$

$y = \frac{x^2 + 3x^3}{x}$
$y = \frac{x^2}{x} + \frac{3x^3}{x}$
$y = x + 3x^2$
$y' = 1 + 6x$

Separate Fractions

$y = \frac{1}{x}$
$y' = \frac{0 \times x - 1 \times 1}{x^2}$
$y' = \frac{-1}{x^2}$

Not a quotient*!