Remember From

1. $\ln(ab) = \ln a$

2. $\ln\left(\frac{a}{b}\right) = \ln$

3. $\ln a^b = b\cdot$

AP Calculus

Derivatives Using Implicit

1-6: Use logarithmic differentiation to fine th

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

$\ln y = \ln[(x+2)^2(x^4+4)^4]$

$\ln y = 2\ln(x+2) + 4\ln(x^4+4)$

$\cancel{y}\cdot\frac{1}{\cancel{y}}\frac{dy}{dx} = \left[2\left(\frac{1}{x+2}\right)(1) + 4\left(\frac{1}{x^4+4}\right)4x^3\right]\cdot y$

$\frac{dy}{dx} = \left[\frac{2}{x+2} + \frac{16x^3}{x^4+4}\right](x+2)^2(x^4+4)$

3. $y = x^x$

$\ln y = \ln x^x$

$\ln y = x\cdot\ln x$

$\frac{1}{y}\frac{dy}{dx} = x\cdot\frac{d}{dx}[\ln x] + \ln x\cdot\frac{d}{dx}[x]$

$\cancel{y}\cdot\frac{1}{\cancel{y}}\frac{dy}{dx} = \left[\cancel{x}\left(\frac{1}{\cancel{x}}\right) + \ln x(1)\right]\cdot y$

$\frac{dy}{dx} = [1+\ln x]\cdot x^x$

5. $y = x^{\sin x}$

$\ln y = \ln x^{\sin x}$

$\ln y = \sin x\cdot\ln x$

$\frac{1}{y}\frac{dy}{dx} = \sin x\cdot\frac{d}{dx}[\ln x] + \ln x\cdot\frac{d}{dx}[\sin x]$

$\cancel{y}\cdot\frac{1}{\cancel{y}}\frac{dy}{dx} = \left[\sin x\left(\frac{1}{x}\right) + \ln x(\cos x)\right]\cdot y$

$\frac{dy}{dx} = \left[\frac{\sin x}{x} + \ln x\cdot\cos x\right]\cdot x^{\sin x}$

AP Calculus

Derivatives Using Implicit

7. $y = \frac{(3x+2)^6(x^2-1)^5}{\sqrt{2x+1}}$

$\ln y = 6\ln(3x+2) + 5\ln(x^2-1) - \frac{1}{2}\ln(2x+1)$

$\cancel{y}\frac{1}{\cancel{y}}\frac{dy}{dx} = \left[6\cdot\frac{1}{3x+2}\cdot 3 + 5\cdot\frac{1}{x^2-1}\cdot 2x - \frac{1}{\cancel{2}}\cdot\frac{1}{2x+1}\cdot\cancel{2}\right]y$

$\frac{dy}{dx} = \left[\frac{18}{3x+2} + \frac{10x}{x^2-1} - \frac{1}{2x+1}\right]\frac{(3x+2)^6(x^2-1)^5}{\sqrt{2x+1}}$

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

$\ln y = \ln(2x-3)^x$

$\ln y = x\cdot\ln(2x-3)$

$\frac{1}{y}\frac{dy}{dx} = x\cdot\frac{d}{dx}[\ln(2x-3)] + \ln(2x-3)\frac{d}{dx}[x]$

$\cancel{y}\frac{1}{\cancel{y}}\frac{dy}{dx} = \left[x\cdot\frac{1}{2x-3}(2) + \ln(2x-3)(1)\right]y$

$\frac{dy}{dx} = \left[\frac{2x}{2x-3} + \ln(2x-3)\right](2x-3)^x$

11. $y = (2x-5)^{3x+2}$

$\ln y = (3x+2)\cdot\ln(2x-5)$

$y\cdot\frac{1}{y}\frac{dy}{dx} = \left[(3x+2)\frac{1}{2x-5}(2) + \ln(2x-5)\cdot(3)\right]$

$\frac{dy}{dx} = \frac{2(3x+2)}{2x-5} + 3\ln(2x-5)$