TOPIC: LOGARITHMIC DIFFERENTIATION

Logarithmic Differentiation

◆ To find $\frac{d}{dx}$ of complicated fcns, take ___ of both sides, *expand* using log properties, then use *implicit differentiation*.

EXAMPLE Find the derivative of $y = \frac{(x+4)(x+2)^5}{(x^3-1)^{2/3}}$

New **Logarithmic Differentiation**

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

$$\ln y = \ln(x+4) \quad \ln(x+2) \quad \ln(x^3-1)$$

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

Recall $\frac{d}{dx}\ln x = \frac{1}{x}$

$$=$$

$$=$$

◆ For some fcns, log diff makes the derivative *easier*. When rules can't be applied _____ (e.g. x^x), it is *necessary*.

TOPIC: LOGARITHMIC DIFFERENTIATION

EXAMPLE Find the derivative of $y = x^x$ using logarithmic differentiation.

PRACTICE Use logarithmic differentiation to find the derivative of the given function.

$$y = \left(\sqrt{x+1}\right)^x$$

TOPIC: LOGARITHMIC DIFFERENTIATION

PRACTICE Use logarithmic differentiation to find the derivative of the given function.

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

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PRACTICE Find the derivative of the given function.

$y = \tan^x x$