

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

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#### Logarithmic Differentiation

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

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

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

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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.

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

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**PRACTICE**

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

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