Find the derivative of $y = \frac{(x+5)}{8x^{20}e^{11x}}$ using logarithmic differentiation.

1. Take the natural logarithm (ln) of both sides of the equation.

$$\ln y = \ln \frac{(x+5)}{8x^{20}e^{11x}}$$

2. Use logarithmic properties to simplify the expression:

$\ln y = \ln \frac{(x+5)}{8x^{20}e^{11x}}$	Quotient to Difference Property
$\ln y = \ln(x+5) - \ln(8x^{20}e^{11x})$	Product to Sum Property
$\ln y = \ln(x+5) - \ln\ 8 - \ln x^{20} - \ln e^{11x}$	Power to Product Property or Bob Barker Property
$\ln y = \ln(x+5) - \ln\ 8 - 20\ln x - \ln e^{11x}$	Inverse Property
$\ln y = \ln(x+5) - \ln\ 8 - 20\ln x - 11x$	

3. Differentiate both sides with respect to *x* using implicit differentiation. Use the chain rule.

$$\frac{d}{dx}\ln y = \frac{d}{dx}\ln(x+5) - \frac{d}{dx}\ln\ 8 - 20\frac{d}{dx}\ln x - 11\frac{d}{dx}x$$

$$\frac{1}{y}\frac{dy}{dx} = \frac{1}{x+5} - 0 - \frac{20}{x} - 11$$

4. Solve for $\frac{dy}{dx}$ and substitute the expression for *y*:

$$\frac{dy}{dx} = y\left(\frac{1}{x+5} - \frac{20}{x} - 11\right)$$

$$\frac{dy}{dx} = \frac{(x+5)}{8x^{20}e^{11x}}\left(\frac{1}{x+5} - \frac{20}{x} - 11\right)$$

5. Simplify the expression:

$\frac{dy}{dx} = \frac{(x+5)}{8x^{20}e^{11x}}\left(\frac{1}{x+5}\right) - \frac{(x+5)}{8x^{20}e^{11x}}\left(\frac{20}{x}\right) - \frac{(x+5)}{8x^{20}e^{11x}} \cdot 11$	Distribute
$\frac{dy}{dx} = \frac{1}{8x^{20}e^{11x}} - \frac{20(x+5)}{8x^{21}e^{11x}} - \frac{11(x+5)}{8x^{20}e^{11x}}$	Simplify $\frac{x+5}{x+5}$ with "1 out"
$\frac{dy}{dx} = \frac{x}{x} \cdot \frac{1}{8x^{20}e^{11x}} - \frac{20(x+5)}{8x^{21}e^{11x}} - \frac{x}{x} \cdot \frac{11(x+5)}{8x^{20}e^{11x}}$	Get common denominators with "1 in"
$\frac{dy}{dx} = \frac{x-20x-100-11x^2-55x}{8x^{21}e^{11x}}$	Combine numerators and distribute.
$\frac{dy}{dx} = \frac{-11x^2 - 74x - 100}{8x^{21}e^{11x}}$	Combine like terms.