Name:
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Math 2B: Quiz 5

(5) **1.** Differentiate the following function. $f(x) = x^{\sin(x)}$
Taking the natural log of both sides we have $\ln(f(x)) = \sin(x)\ln(x)$

$$\begin{aligned}
\frac{d}{dx}\ln(f(x)) = \frac{d}{dx}\sin(x)\ln(x) \quad &\Rightarrow \quad \frac{f'(x)}{f(x)} = \cos(x)\ln(x) + \frac{\sin(x)}{x} \\
&\Rightarrow \quad f'(x) = f(x)\left(\cos(x)\ln(x) + \frac{\sin(x)}{x}\right) \\
&\Rightarrow \quad f'(x) = x^{\sin(x)}\left(\cos(x)\ln(x) + \frac{\sin(x)}{x}\right)
\end{aligned}$$

(5) **2.** Integrate $\displaystyle\int \frac{e^{1\backslash x}}{x^2}dx$
Let $u = x^{-1}$, then $dx = -x^{-2}du$, so our integral is

$$\int \frac{e^{1\backslash x}}{x^2}dx = -\int e^u du = -e^u + C = -e^{1\backslash x} + C$$