$$
\begin{aligned}
F(x) &= \int_{\ln(x)}^{2} y^6 + 3^y \, dy \\
&= -\int_{2}^{\ln(x)} y^6 + 3^y \, dy && \text{Flipping Bounds of Integration}
\end{aligned}
$$

letting $f(y) = y^6 + 3^y$ and $u(x) = \ln(x)$, we get

$$
= -\int_{2}^{u(x)} f(y) \, dy.
$$

Using chain rule,

$$
\begin{aligned}
F'(x) &= -f\left(u(x)\right) \frac{du}{dx} \\
&= -f\left(\ln\left(x\right)\right) \frac{d}{dx} \left(\ln(x)\right) \\
&= -\left(\left(\ln\left(x\right)\right)^6 + 3^{\ln x}\right)\left(\frac{1}{x}\right) \\
&= -\frac{\left(\left(\ln\left(x\right)\right)^6 + 3^{\ln x}\right)}{x}.
\end{aligned}
$$