1. Q) Surface area of rvolution:

$y = \sqrt{1+e^x}, 0 \le x \le 3$

A) $\boxed{S = \int_a^b 2\pi f(x)\sqrt{1+[f'(x)^2]}dx}$

$$
\begin{aligned}
f &= (1+e^x)^{1/2} \\
f' &= \frac{e^x}{2\sqrt{1+e^x}} \\
S &= \int_0^3 2\pi(1+e^x)^{1/2}\sqrt{1+(\frac{e^x}{2\sqrt{1+e^x}})^2}dx \\
&= 2\pi\int_0^3 (1+e^x)^{1/2}\sqrt{1+\frac{e^{2x}}{4(1+e^x)}}dx \\
&= \pi\int_0^3 \sqrt{4(1+e^x)+e^{2x}}dx \\
&= \pi\int_0^3 \sqrt{2^2+2.2.e^x+e^{x\,2}}dx = \pi\int_0^3 (2+e^x)dx \\
&= \pi\left[2x+e^x\right]_0^3 \\
&= \pi\left[6+e^3-0-e^0\right] \\
&= \pi\left[5+e^3\right]
\end{aligned}
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