(b) Is there any other simpler way to calculate the integral? (**Hint**: You do not need to find the antiderivative of the function.) (1 pt)

$f(x) = x^2 \sin(x)$ is an odd function, i.e., $f(x) = -f(-x)$. So, its integral over any symmetric interval $[-a, a]$ is zero.

3. (a) What is the area between the graph of $f(x) = \frac{e^x}{\sqrt{1-e^{2x}}}$ and the x-axis on the interval $[\ln \frac{1}{2}, 0]$? (4 pts)

$$I = \int_{\ln(\frac{1}{2})}^{0} \frac{e^x}{\sqrt{1-e^{2x}}}\, dx.$$

Let $u = e^x$. Then $du = e^x dx$.

$$x = 0 \Rightarrow u = e^0 = 1$$
$$x = \ln(\tfrac{1}{2}) \Rightarrow u = e^{\ln(\frac{1}{2})} = \tfrac{1}{2}.$$

$$I = \int_{1/2}^{1} \frac{du}{\sqrt{1-u^2}} = \arcsin(u)\Big|_{1/2}^{1}$$

$$= \arcsin(1) - \arcsin(\tfrac{1}{2})$$

$$= \frac{\pi}{2} - \frac{\pi}{6}$$

$$= \frac{\pi}{3}$$