

Solution to Problem 21) Considering that $\sin(2x) = 2 \sin x \cos x$, application of the method of integration by parts yields

$$\begin{aligned} 2 \int_0^{\pi/2} \exp(p \sin x) \sin x \cos x \, dx &= (2/p) \exp(p \sin x) \sin x \Big|_0^{\pi/2} \\ &\quad - (2/p) \int_0^{\pi/2} \exp(p \sin x) \cos x \, dx \\ &= (2/p)e^p - (2/p^2) \exp(p \sin x) \Big|_0^{\pi/2} \\ &= (2/p)e^p - (2/p^2)e^p + (2/p^2) \\ &= 2 [1 + (p - 1)e^p]/p^2. \end{aligned}$$
