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1. (a) $\frac{1}{3} \ln |\cos(3t) - 1| - \frac{2}{3} \ln |\cos(3t) - 2| + C$
(b) $\frac{4}{3\pi}$
 2. $\ln(\sqrt{5} + 2)$
 3. The integral converges and equals $\frac{4}{9}e^{-3}$.
 4. 20 cm
 5. (a) $W = \int_0^1 1000g\pi(e^y - 1)^2(1 - y) dy = 1000\pi g \int_0^1 (e^y - 1)^2(1 - y) dy$
(b) 5200 J