HW Soln §7.1

#33. $\int \cos\sqrt{x}\, dx = \int \cos u\,(2u\,du)$

substitution: $u = \sqrt{x} = x^{1/2}$

$du = \frac{1}{2}x^{-1/2}dx = \frac{1}{2\sqrt{x}}dx$

so $dx = 2\sqrt{x}\,du = 2u\,du$

$= 2\int u\cos u\,du$

int. by parts:

$w = u \quad dv = \cos u\,du$

$dw = du \quad v = \sin u$

$= 2\left(u\sin u - \int \sin u\,du\right)$

$= 2u\sin u + 2\cos u + C$

$= 2\sqrt{x}\sin\sqrt{x} + 2\cos\sqrt{x} + C$

#6.3. $v = t^2e^{-t}$

$s(t) = \int_0^t v(t)dt = \int_0^t t^2e^{-t}dt = -t^2e^{-t}\Big|_0^t + 2\int_0^t te^{-t}dt$

$= -t^2e^{-t} - 0 + 2\left(-te^{-t}\Big|_0^t + \int_0^t e^{-t}dt\right)$

$= -t^2e^{-t} + 2\left(-te^{-t} + 0 - e^{-t}\Big|_0^t\right)$

$= -t^2e^{-t} - 2te^{-t} - 2(e^{-t} - 1)$

$= 2 - (t^2 + 2t + 2)e^{-t}$

int. by parts:

$u = t^2 \quad dv = e^{-t}dt$

$du = 2t\,dt \quad v = -e^{-t}$

int. by parts:

$u = t \quad dv = e^{-t}dt$

$du = dt \quad v = -e^{-t}$

Note that if you merely find the antiderivative of v(t) your answer will ~~either~~ have a +C (which you have find so that the distance traveled is zero when t=0)