Math 152 Quiz #5

1. Volume of Solid $= V = \displaystyle\int_0^2 2\pi x e^{5x}\,dx$ (Int. by Parts: $u = x \;\Rightarrow\; du = dx$

$= 2\pi[\frac{1}{5}xe^{5x}|_0^2 - \displaystyle\int_0^2 \frac{1}{5}e^{5x}\,dx]$ $dv = e^{5x} \;\Rightarrow\; v = \frac{1}{5}e^{5x}$)

$= 2\pi[\frac{2}{5}e^{10} - 0 - \frac{1}{25}e^{5x}|_0^2\ ]$

$= 2\pi[\frac{2}{5}e^{10} - \frac{1}{25}e^{10} + \frac{1}{25}\ ]$

$= \boxed{2\pi[\frac{9}{25}e^{10} + \frac{1}{25}]}$

2. Average velocity $= \frac{1}{2}\displaystyle\int_0^2 2t^2(8-t^3)^9\,dt$

$= -\frac{1}{3}\displaystyle\int_8^0 u^9\,du$ (Substitution: $u = 8 - t^3 \;\Rightarrow\; -\frac{1}{3}\,du = t^2\,dt$)

$= -\frac{1}{30}u^{10}\ |_8^0\ = \boxed{\frac{1}{30}8^{10}}$

(Note: I changed my bounds to u-values, but you can always go back to the variable t and evaluate at the original bounds.)

3. Int. by Parts: $u = \ln x \;\Rightarrow\; du = \frac{1}{x}\,dx$ $dv = x^7\,dx \;\Rightarrow\; v = \frac{1}{8}x^8$

$\Rightarrow \displaystyle\int x^7 \cdot \ln x\,dx = \frac{1}{8}x^8 \ln x - \int \frac{1}{8}x^7\,dx$

$= \boxed{\frac{1}{8}x^8 \ln x - \frac{1}{64}x^8 + C}$