Math 119 HW #6

Section 4.3 #65b

Section 4.4 #10, 16, 17, 40a

4.3 #65b $V(r) = \frac{4}{3}\pi r^3$ so $\frac{dV}{dr} = \frac{4}{3}\pi \cdot 3r^2 = 4\pi r^2$

$S(r) = 4\pi r^2$ so $\frac{dS}{dr} = 8\pi r$

$r(t) = 6 - \frac{3}{17}t$ so $\frac{dr}{dt} = -\frac{3}{17}$

$$\frac{dV}{dt} = \frac{dV}{dr}\cdot\frac{dr}{dt} = 4\pi r^2 \cdot \frac{-3}{17} = 4\pi\left(6-\frac{3}{17}t\right)^2 \cdot \frac{-3}{17}$$

so at $t = 17$, $\frac{dV}{dt} = 4\pi\left(6-\frac{3}{17}\cdot 17\right)^2 \cdot \frac{-3}{17}$

$$= 4\pi \cdot 9 \cdot \frac{-3}{17} = -\frac{108}{17}\pi$$

4.4 #10 $y = -5e^{4x^3}$

$\frac{dy}{dx} = -5e^{4x^3} \cdot 12x^2 = -60x^2 e^{4x^3}$

(chain rule)

4.4 #16 $y = (3x^3 - 4x)e^{-5x}$

$\frac{dy}{dx} = (3x^3-4x)\cdot e^{-5x}\cdot(-5) + e^{-5x}\cdot(9x^2-4)$

4.4 #17 $y = \frac{x^2}{e^x}$

$$\frac{dy}{dx} = \frac{e^x \cdot 2x - x^2 \cdot e^x}{(e^x)^2}$$

4.4 #40a $A(t) = 10t^2 2^{-t}$

$$A'(t) = 10t^2 \cdot 2^{-t} \ln 2 \cdot (-1) + 2^{-t} \cdot 20t$$

so $A'(2) = 10 \cdot 2^2 \cdot 2^{-2} \ln 2 \cdot -1 + 2^{-2} \cdot 20 \cdot 2$