① Find the ave. value of $f(x) = 3x^2 + 4x + 1$ $[1,4]$

then find where $f(x)$ attains its ave. value.

$$\frac{1}{4-1}\int_1^4 (3x^2+4x+1)\,dx$$

$$= 32$$

$$32 = 3x^2 + 4x + 1$$

$$0 = 3x^2 + 4x - 31$$

$$x \approx 2.616, \cancel{-3.949}$$

$$\frac{d}{dx}\int_x^1 e^{\sin t}\tan t^2\,dt$$

$$-\frac{d}{dx}\int_1^x e^{\sin t}\tan t^2\,dt$$

$$= -e^{\sin x}\tan x^2$$

$$\frac{d}{dx}\int_4^{3x^2} (t^3-1)\,dt$$

$$f(g(x))\cdot g'(x)$$

$$= \left[(3x^2)^3 - 1\right]\cdot(6x)$$

$$= [27x^6 - 1](6x)$$

$$= 162x^7 - 6x$$

1200 gallons of water @ $t=0$

time $[0,18]$ hrs. water pumped into tank

at a rate of $W(t) = 95\sqrt{t}\,\sin^2\left(\frac{t}{6}\right)$ gal/hr.

a) Write an expression to determine how much water will be pumped in over the 18 hrs.

$$\int_0^{18} w(t)\,dt \quad \text{or} \quad \int_0^{18} \left(95\sqrt{t}\,\sin^2\left(\frac{t}{6}\right)\right) dt$$

b) How much in the tank after the 18 hrs.

$$1200 + \int_0^{18} w(t)\,dt$$

c) If the tank was being drained at a rate of $R(t) = 275\sin^2\left(\frac{t}{3}\right)$ gallons/hr.

How much water in tank at any given time t.

$$1200 + \int_0^{t} w(t)\,dt - \int_0^{t} R(t)\,dt$$