MATH 2343 2343-1p2.gif

C & H: Sec 1.2

4) $\frac{d}{dt}(t^4) = 4\frac{(t^4)^2}{t^5}$

$4t^3 = 4t^8/t^5 = 4t^3$ ✓

6) $\frac{d}{dt}(3e^{4t}+2) = 4(3e^{4t}+2) - 8$

$12e^{4t} + 0 = 12e^{4t} + 8 - 8$ ✓

10) $\frac{dx}{dt} = 8e^{-t}$

$x(t) = -8e^{-t} + C$

12) $\frac{dx}{dt} = 2\sin 7t$

$x(t) = -\frac{2}{7}\cos 7t + C$

15) $\frac{dx}{dt} = \ln(4+\cos^2 t)$

$\int_{t_0}^{t} \frac{dx}{ds}\,ds = \int_{t_0}^{t} \ln(4+\cos^2 s)\,ds$

$x(s)\Big|_{t_0}^{t} = $ "

$x(t) - x(t_0) = $ "

$x(t) = x(t_0) + \int_{t_0}^{t} \ln(4+\cos^2 s)\,ds$

18) $\frac{dx}{dt} = t^{3/2}$ $x(3) = 7$

Indef integral:

$x(t) = \frac{2}{5}t^{5/2} + C$

$x(3) = \frac{2}{5}(3)^{5/2} + C = 7$

$C = 7 - \frac{18}{5}\sqrt{3}$

$x(t) = \frac{2}{5}t^{5/2} + 7 - \frac{18}{5}\sqrt{3}$

Def. integral

$\int_3^t \frac{dx}{ds}\,ds = \int_3^t s^{3/2}\,ds$

$x(s)\Big|_3^t = \frac{2}{5}s^{5/2}\Big|_3^t$

$x(t) - x(3) = \frac{2}{5}t^{5/2} - \frac{2}{5}3^{5/2}$

$x(t) = \frac{2}{5}t^{5/2} - \frac{18}{5}\sqrt{3} + 7$

23) • Acceleration: $\frac{d^2x}{dt^2} = -15$

$\int_0^t \frac{d^2}{ds^2}x\,ds = \int_0^t -15\,ds$

$\frac{dx(t)}{dt} - \frac{dx}{dt}(0) = -15(t-0)$

v_0 = Initial speed = ?

• Speed: $\frac{dx}{dt} = v_0 - 15t$

$\int_0^t \frac{dx}{ds}\,ds = \int_0^t v_0 - 15s\,ds$

$x(t) - x(0) = v_0(t-0) - 15(\frac{1}{2}t^2 - 0)$

$x(t) - x(0) = v_0 t - \frac{15}{2}t^2$

• Given that $x(t_f) - x(0) = 75$

Car travel 75 m from initial time to final time.

$\therefore 75 = v_0 t_f - \frac{15}{2}t_f^2$

• when $t = t_f$ the car has stopped.

$\Rightarrow v(t_f) = \frac{dx}{dt}(t_f) = 0$

$\therefore 0 = v_0 - 15t_f$

2 Eqn for 2 unknowns v_0 & t_f

$\Rightarrow v_0 = 15t_f$

$75 = (15t_f)t_f - \frac{15}{2}t_f^2$

$\Rightarrow t_f = \sqrt{10}$

$v_0 = 15\sqrt{10}$