E+P, Growth/Decay cont'd.

p. 358

#27

$y = y_0 e^{kt}$

① $2 = y_0 \cdot 1$

$y_0 = 2$

$y = 2e^{kt}$

② $5 = 2e^{2k}$

$\frac{5}{2} = e^{2k}$

$\ln\left(\frac{5}{2}\right) = 2k$

$k = \frac{\ln\left(\frac{5}{2}\right)}{2}$

if $\frac{dy}{dt} = ky$ then $y = y_0 e^{kt}$

general solution.

two I.C.s

① (0, 2)

② (2, 5)

Particular Solution

$y = 2e^{\frac{\ln\left(\frac{5}{2}\right)}{2}t}$

#28 check Wed.

BC: Ex 1 & 2 p. 363

p. 386

$\frac{d}{dt}x(t) = v(t)$ vel.

$\frac{d}{dt}v(t) = a(t)$ accel.

$v(t) = \int a(t)\,dt$ (I.C. $+ v_0$)

$x(t) = \int v(t)\,dt$ (I.C. $+ x_0$)

(a) when is particle moving to right, $v > 0$

left, $v < 0$ stopped $v = 0$

(b) displacement (change in x) over time interval $\int_{t_0}^{t_1} v(t)\,dt$ FTC #2 $(x_1 - x_0)$

final position if $x(0) = 3$: $3 + \int$

(c) total distance traveled $\int_{t_0}^{t_1} |v(t)|\,dt$

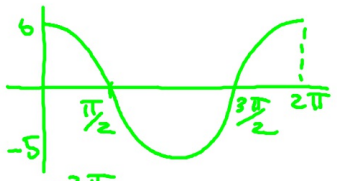
↑ negative velocities become positive

#1 $v(t) = 5\cos t \quad 0 \le t \le 2\pi$

(a) right $0 \le t < \frac{\pi}{2}$, $\frac{3\pi}{2} < t \le 2\pi$

left $\frac{\pi}{2} < t < \frac{3\pi}{2}$

stopped $t = \frac{\pi}{2}, \frac{3\pi}{2}$



(b) $\int_0^{2\pi} 5\cos t\,dt = 5\int_0^{2\pi} \cos t\,dt$

$= 5\sin t\Big|_0^{2\pi} = 0 - 0 = 0$ displacement

if $s(0) = 3$, then $s(2\pi) = 3 + 0 = 3$

(c) total dist: $\int_0^{\frac{\pi}{2}} 5\cos t\,dt - \int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} 5\cos t\,dt + \int_{\frac{3\pi}{2}}^{2\pi} 5\cos t\,dt$

pos accum. neg accum. pos accum

$5\sin t\Big|_0^{\frac{\pi}{2}} - 5\sin t\Big|_{\frac{\pi}{2}}^{\frac{3\pi}{2}} + 5\sin t\Big|_{\frac{3\pi}{2}}^{2\pi}$

$(5 - 0) - (-5 - 5) + (0 - (-5))$

$5 + 10 + 5 = 20$