HOMEWORK 10-5.2

12 $P = P_0 e^{rt}$

doubles in ten years

$$2P_0 = P_0 e^{r(10)}$$

$$e^{10r} = 2$$

$$\ln e^{10r} = \ln 2$$

$$10r = \ln 2$$

$$r = \frac{\ln 2}{10}$$

25 (A) How fast growing in 3 years?

(d) $A'(3)$

(B) General form for $A(t)$.

(a) Pe^{rt}

(C) How long till deposit triples?

(h) solve $A(t) = 3A(0)$ for t

(D) Balance after 3 years.

(b) $A(3)$

(E) When will balance be 3 dollars?

(f) solve $A(t) = 3$ for t

(F) When will balance be 3 dollars/year?

(e) solve $A'(t) = 3$ for t

(G) Principal amount? (c) $A(0)$

(H) Give a differential equation.

(g) $y' = ry$

5.4 #12

$$f(t) = 50{,}000(1 - e^{-.3t})$$

(a) After 10 days,

$f(10) = 50{,}000(1 - e^{-.3(10)}) =$ 47,510 people

(b) $f'(t) = .3(50{,}000)\, e^{-0.3t}$

$= 15{,}000\, e^{-0.3t}$

$f'(0) = 15{,}000\, e^{0} = 15{,}000$ people/day

(c) $22{,}500 = 50000(1 - e^{-.3t})$

$.45 = 1 - e^{-.3t}$

$e^{-.3t} = .55$

$-.3t = \ln .55$

$t = \dfrac{-\ln .55}{.3}$

$t \approx 1.99$ days about 2 days

(d) $2500 = 15000\, e^{-.3t}$

$0.167 = e^{-.3t}$

$-.3t = \ln 0.167$

$t = \dfrac{-\ln 0.167}{.3} \approx 5.97$ days about 6 days

Additional exercises:

① $m = \frac{2}{3}\log\left(\frac{E}{10^4 \cdot 4}\right)$

$\log\left(\frac{E}{10^4 \cdot 4}\right) = \frac{3}{2}m$

$10^{\frac{3}{2}m} = \frac{E}{10^4 \cdot 4}$

$E = 10^4 \cdot 10^{3/2 m} \cdot 4$

$$\frac{E_{6.8}}{E_6} = \frac{10^4 \cdot 10^{3/2(6.8)} \cdot 4}{10^4 \cdot 10^{3/2(6)} \cdot 4} = 10^{3/2(6.8-6)} = 10^{1.2}$$

≈ 15.85 times stronger

Population growth is exponential, so it's good to graph it this way.