4. (a) $K = 150 \text{ tons/hectare}$  
(b) $B'(a) = \frac{13500 \ e^{-a/10}}{(10 + 90 \ e^{-a/10})^2}$

(c) $B(a) = 75 \Rightarrow a = 10 \ln 9 = 22.0 \text{ years}$

(d) $B''(a) = r B' \left( \frac{K - B}{K} \right) + r B \left( - \frac{B'}{K} \right) = r B' \left( 1 - \frac{2B}{K} \right) = 0 \text{ when } B = K/2$ so $B'$ is maximized when $B=K/2$. This implies that the stand being harvested at 22 years would be harvested when the biomass growth rate has been maximized. Harvesting later than this would give a period of stand growth at lower than the maximum growth rate.

5. $N(t) = \frac{1}{2} t^3 + \frac{t^2}{2} + 4t + 2$

6. $\int_0^2 \left(4x^2 - 2x^2\right) \, dx = 8/3$

7. (a) $-\frac{3}{4} e^{-4x} \left(x + \frac{1}{4}\right) + C$  
(b) $\frac{4}{9} = .44$  
(c) $\frac{(\ln x)^2}{2} + C$

8. (a) $L'(0) = .2 (40 - 3) = 7.4 \text{ cm/month}$

(b) $L(0) = 3 = 40(1 - e^{-2t_0}) \Rightarrow t_0 = 5 \ln(37/40) = -.39$

so $L(t) = 20 = 40 \left( 1 - e^{-.2(t + .39)} \right)$ which implies $t = -5 \ln(1/2) - .39 = 3.07 \text{ months}$

9. $\int_0^6 40 \ (12 - x) \pi \left( \frac{-1}{4} x + 6 \right)^2 \, dx = 61830 \pi = 194244 \text{ kg m}$

10. (a) $y(t) = 4 e^{t^2 + t}$  
(b) $N(t) = c \ t^{1/2}$