14.7

b) Implicit scheme

$$x_{n+1} = x_n + \left(r\, \tilde{x}_{n+1}\left(1 - \frac{\tilde{x}_{n+1}}{k}\right)\right) dt$$

$$x_{n+1} - \frac{r x_{n+1} (k) dt + r (x_{n+1})^2 dt}{k} = x_n$$

$$k\, x_{n+1} - r\, x_{n+1} (k) dt + r (x_{n+1})^2 dt = x_n k$$

$$r (x_{n+1})^2 dt + x_{n+1} (k - rk\, dt) - x_n k$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-(k - rk\, dt) \pm \sqrt{(k - r\, dt)^2 + 4 r\, dt\, x_n k}}{2 r\, dt}$$

$$x_{n+1} = + k \; \frac{-(1 - r\, dt) \pm \sqrt{(1 - r\, dt)^2 + 4 r\, dt \frac{x_n}{k}}}{2 r\, dt}$$