**3.** Let $b$ be the rate of births and $d$ the rate of deaths. Then $b = k_1 P$ and $d = k_2 P^2$. Since $dP/dt = b - d$, the differential equation is $dP/dt = k_1 P - k_2 P^2$.

**5.** From the graph in the text we estimate $T_0 = 180°$ and $T_m = 75°$. We observe that when $T = 85$, $dT/dt \approx -1$. From the differential equation we then have

$$k = \frac{dT/dt}{T - T_m} = \frac{-1}{85 - 75} = -0.1.$$

**7.** The number of students with the flu is $x$ and the number not infected is $1000 - x$, so $dx/dt = kx(1000 - x)$.

**9.** The rate at which salt is leaving the tank is

$$R_{out}\ (3 \text{ gal/min}) \cdot \left(\frac{A}{300} \text{ lb/gal}\right) = \frac{A}{100} \text{ lb/min}.$$

Thus $dA/dt = -A/100$ (where the minus sign is used since the amount of salt is decreasing. The initial amount is $A(0) = 50$.

**15.** Since $i = dq/dt$ and $L\, d^2q/dt^2 + R\, dq/dt = E(t)$, we obtain $L\, di/dt + Ri = E(t)$.