MATH 1200 2004/5

Solutions to HW 17

1. Pop in 2000 = $P(5) = (150{,}000)\cdot(1.04)^5 \approx 182{,}500$
Pop in 2005 = $P(10) = (150{,}000)\cdot(1.04)^{10} \approx 222{,}000$
Doubling time $= d = \dfrac{\log 2}{\log 1.04} \approx 17.67$ years.

2. $b^{127} = \frac{1}{2} \Rightarrow b = (0.5)^{1/127} \approx 0.9945$. Thus $\boxed{A(t) = (0.35)\cdot(0.9945)^t}$

3. $h = \log(1/2)/\log(0.973) \approx 25.3$ years.

4. $-\log\left(\frac{1}{2}[H^+]\right) = -\log\left(\frac{1}{2}\right) - \log[H^+] = -\log[H^+] + \log 2$
(since $\log\frac{1}{2} = -\log 2$)
Answer pH increases by $\log 2 \approx 0.301$.

5. $\int 7x^5\,dx = 7\dfrac{x^6}{6} + C.$

$F(x) = \frac{7}{6}x^6 + C$; $1 = F(1) = \frac{7}{6} + C \Rightarrow C = \frac{1}{6}$.

Thus $\boxed{F(x) = \frac{7}{6}x^6 + \frac{1}{6}.}$

6. (i) $\int x^8\,dx = \frac{1}{9}x^9 + C$ (ii) $\int x^3 + \sqrt{x}\,dx = \frac{1}{4}x^4 + \frac{2}{3}x^{3/2} + C$

(iii) $\int 8x^7 + 3x^5\,dx = 8\cdot\dfrac{x^8}{8} + 3\dfrac{x^6}{6} + C = x^8 + \frac{1}{2}x^6 + C$

(iv) $\int 7\sqrt[6]{x}\,dx = 7\int x^{1/6}\,dx = 7\cdot\dfrac{x^{7/6}}{7/6} + C = 6x^{7/6} + C$

(v) $\int 11/x^{10}\,dx = 11\int x^{-10}\,dx = 11\cdot\dfrac{x^{-9}}{-9} + C = -\frac{9}{11}\cdot\frac{1}{x^9} + C$

(vi) $\int \sqrt[3]{x} + \dfrac{3}{\sqrt[4]{x}}\,dx = \int x^{1/3}\,dx + 3\int x^{-1/4}\,dx$

$= \frac{3}{4}x^{4/3} + 3\cdot\frac{4}{3}x^{3/4} + C$

$= \frac{3}{4}x^{4/3} + 4x^{3/4} + C$