1987 BC 1

a. $N = N_0 e^{kt}$

$\frac{dy}{dt} = ky$

$\int \frac{dy}{y} = \int k\,dt$

$\ln y = kt + c$

$e^{\ln y} = e^{kt+c}$

$y = Ce^{kt}$

$t = 0 \quad p = 1000$

$1000 = Ce^{k(0)}$

$C = 1000$

$y = 1000e^{kt}$

$3000 = 1000e^{k(5)}$

$3 = e^{k5}$

$\ln 3 = k5$

$\frac{\ln 3}{5} = k$

$y = 1000e^{\frac{\ln 3}{5}t}$

$.2197t$

b. $y = 1000e^{\frac{\ln 3}{5}(10)}$

$y = 8997.97$

8.998 FACTOR

(9)

c. $6000 = 1000e^{\frac{\ln 3}{5}t}$

$6 = e^{\frac{\ln 3}{5}t}$

$\ln 6 = \frac{\ln 3}{5}t$

$t = \frac{5 \ln 6}{\ln 3}$

$t = 8.15$

5 days

BC2

a) $3y^2\frac{dy}{dx} + 3x^2\frac{dy}{dx} + 6xy = 0$

$\frac{dy}{dx}(3y^2 + 3x^2) = -6xy$

$\frac{dy}{dx} = \frac{-6xy}{3y^2 + 3x^2}$

b)

$\frac{dy}{dx} = \frac{-6(2)(-1)}{3(-1)^2 + 3(2)^2} = .8 = \frac{4}{5}$

$\underline{4 = Y + 1}$

1987 BC2

c. $0 = \dfrac{-6xy}{3y^2+3x^2}$

Critical $x=0$ $y=0$

$3y^2+3x^2=0$

Denominator of deriv. is equal to zero only when $x=0$ and $y=0$

$\therefore$ minimum at $(0,0)$

b. $\pi \int_1^3 (\ln x)^2$

$= 3.23$
OR
1.0292π

c. $\int_1^3 2\pi(3-x)(\ln x)\,dx$

3a.

$\int_1^3 \ln x\,dx$

$u = \ln x \quad dv = dx$
$du = \frac{1}{x} \quad v = x$

$(\ln x)x - \int x \cdot \frac{1}{x}$

$= x\ln x - \int 1$

$= x\ln x - x\Big]_1^3$

$= 3\ln 3 - 3 - [1\ln 1 - 1]$
$= 3\ln 3 - 3 - (0-1)$
$= 3\ln 3 - 2 = 1.296$