

Answer to Unit 2 Test 1 Preview

1. a) *Model A*: $M = 792.9$ tonnes *Model B*: $M = 750.7$ tonnes

b) *Model A*: $\frac{dM}{dt} = \frac{4500}{(3t+2)^2}$ $\frac{dM}{dt} = 23.0$ tonnes per year

Model B: $\frac{dM}{dt} = \frac{7500}{(t+1)(2+5\ln(t+1))^2}$ $\frac{dM}{dt} = 14.9$ tonnes per year

c) *Model A*

2. i) $\frac{\partial u}{\partial t} = -k^2 e^{-k^2 t} \sin x$

ii) $\frac{\partial u}{\partial x} = e^{-k^2 t} \cos x$ $\frac{\partial^2 u}{\partial x^2} = -e^{-k^2 t} \sin x$

3. $2 \tan^{-1} 2 - \frac{1}{2} \ln 5$

4. a) 0.72552 0.89031

b) 1.0697

d) $6 + 12 \ln 2 - 12 \ln 3$

e) 0.065

5. b) (i) $7\sqrt{2}$

ii) $\frac{24a+7b}{25} + \left(\frac{24b-7a}{25}\right)i$

Correction for iii) $w = \frac{2}{5} - \frac{11}{5}i$

iii) $a = 1$ $b = -2$

iv) $\arg w = -1.391$