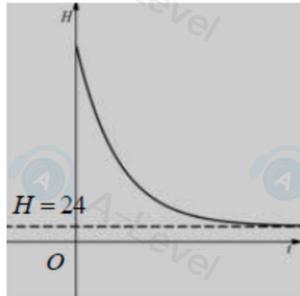


<b>6. (a)</b>	$f'(x) = 6(2x-3)^2 e^{4x-2} + 4(2x-3)^3 e^{4x-2}$ $= 2(2x-3)^2 e^{4x-2} \{3 + 2(2x-3)\} = 2(4x-3)(2x-3)^2 e^{4x-2}$	M1 A1 dM1 A1 <b>(4)</b>
<b>(b) (i)</b>	$x = \frac{3}{2}, \frac{3}{4}$	B1 ft
<b>(ii)</b>	Attempts $f\left(\frac{3}{4}\right) = \left(-\frac{3}{2}\right)^3 e^1 = -\frac{27}{8}e, \Rightarrow g\left(\frac{3}{4}\right) = -27e$ $-27e, g(x), 0g g \xi$	M1, A1 A1 <b>(4)</b>
		<b>(8 marks)</b>

Question Number	Scheme	Marks
<b>3. (a)</b>	$\frac{dx}{dy} = \frac{8y(2y+1) - 2(4y^2 - 3)}{(2y+1)^2}$ $\frac{dy}{dx} = \frac{(2y+1)^2}{8y^2 + 8y + 6}$	M1 A1 dM1, A1 <b>(4)</b>
<b>(b)</b>	Sets $\frac{(2y+1)^2}{8y^2 + 8y + 6} = \frac{1}{3} \Rightarrow 4y^2 + 4y - 3 = 0$ $\Rightarrow (2y-1)(2y+3) = 0 \Rightarrow y = \frac{1}{2}, x = \dots$ $P = \left(-1, \frac{1}{2}\right)$ only	M1, A1 dM1 A1 <b>(4)</b>
		<b>(8 marks)</b>

<b>8. (a)</b>	$f'(x) = 6(2x+1)^2 e^{-4x} - 4(2x+1)^3 e^{-4x}$ $= 2(2x+1)^2 e^{-4x} \{3 - 2(2x+1)\}$ $= 2(2x+1)^2 (1-4x) e^{-4x}$	M1 A1 dM1 A1 <b>(4)</b>
<b>(b)</b>	Sets $f'(x) = 0 \Rightarrow x = -\frac{1}{2}, \frac{1}{4}$ Either $f\left(-\frac{1}{2}\right) = \dots$ or $f\left(\frac{1}{4}\right) = \dots$ Both $\left(-\frac{1}{2}, 0\right)$ and $\left(\frac{1}{4}, \frac{27}{8e}\right)$	B1 M1 A1 <b>(3)</b>
<b>(c)</b>	$\left(\frac{9}{4}, \frac{27}{e}\right)$	B1ft B1ft <b>(2)</b>
		<b>9 marks</b>

<b>6(a)</b>	$\log_{10} S = 4.5 - 0.006 \times 2 \Rightarrow S = 10^{4.5 - 0.006 \times 2} = 30800 \text{ km}^2$	M1A1 <b>(2)</b>
<b>(b)</b>	$\log_{10} S = 4.5 - 0.006t \Rightarrow S = 10^{4.5 - 0.006t}$ (or $p = 10^{4.5}$ or $q = 10^{-0.006}$ )	M1
	$S = 10^{4.5 - 0.006t} = 10^{4.5} \times (10^{-0.006})^t$ (or $p = 10^{4.5}$ and $q = 10^{-0.006}$ )	dM1
	$S = 31600 \times (0.986)^t$	A1 <b>(3)</b>
<b>(c)</b>	E.g. The proportion of area covered by coral reefs retained from year to year.	B1 <b>(1)</b>
		<b>(6 marks)</b>

<b>5 (a)</b>	304(°C)	B1 <b>(1)</b>
<b>(b)</b>		Shape or Asymptote Fully correct Shape and Asymptote
		M1 A1 <b>(2)</b>
<b>(c)</b>	$144 = 280e^{-0.05t} + 24 \Rightarrow 280e^{-0.05t} = 120$ Correct use of lns $\Rightarrow -0.05t = \ln \frac{120}{280} \Rightarrow t = 16.95$	M1 dM1 A1 <b>(3)</b>
<b>(d)</b>	$\left(\frac{dH}{dt}\right) = -0.05 \times 280e^{-0.05t}$	M1
	$\frac{dH}{dt} = -0.05 \times (H - 24) \Rightarrow \frac{dH}{dt} = 1.2 - 0.05H$	M1, A1cso <b>(3)</b> <b>(9 marks)</b>

Question Number	Scheme	Marks
<b>5(a)</b>	$\left(\frac{4000e^0}{19+e^0}\right) = 200$	B1
		<b>(1)</b>
<b>(b)</b>	$\frac{dN}{dt} = \frac{(19+e^{0.2t}) \times 400e^{0.1t} - 4000e^{0.1t} \times 0.2e^{0.2t}}{(19+e^{0.2t})^2}$	M1A1
		<b>(2)</b>
<b>(c)</b>	$(19+e^{0.2t}) \times 400e^{0.1t} - 4000e^{0.1t} \times 0.2e^{0.2t} = 0 \Rightarrow e^{0.2t} = 19$	M1A1
		<b>(2)</b>
<b>(d)</b>	$e^{0.2T} = 19 \Rightarrow T = \frac{\ln 19}{0.2} (= 14.7\dots)$	M1
	$N = \frac{4000e^{0.1 \times 14.7}}{19+e^{0.2 \times 14.7}} = 458.8\dots \Rightarrow 459 \text{ squirrels}$	dM1A1
		<b>(3)</b>
		<b>(8 marks)</b>