Recurrence Relations Homework - Marking Scheme

Question	Main points of expected responses	
1 (a)	One correct All correct	•1 $\boldsymbol{T_1 = 38}$ •2 $\boldsymbol{T_2 = 36.2}$, $\boldsymbol{T_3 = 34.58}$
1 (b)	Statement anf formula	•3 $\boldsymbol{Limit\ exist\ since\ -1 < 0.9 < 1}$ $\boldsymbol{L = 0.9L + 2}$
	Limit	•4 $\boldsymbol{L = 20}$
2 (a)	Recurrence relation first term	•1 $\boldsymbol{U_{n+1} = 0.8T_n}$
	Second term	•2 $\boldsymbol{+4}$
2 (b)	End of first month	•3 $\boldsymbol{U_1 = 0.8(36) + 4\ = 32.8}$
	End of six month	•4 $\boldsymbol{U_6 = 24.2\ litres}$
2 (c)	Limit Conclusion	•5 $\boldsymbol{L = 0.8L + 4}$ $\boldsymbol{L = \frac{C}{1-m} = 20}$ •6 ***Just before the end of the month*** ***coolant minimum is 16 litres*** ***so not in danger of overheating***
3 (a)	Evidence of Sim. Equations	•1 $\boldsymbol{430 = 190a + b}$, $\boldsymbol{910 = 430a + b}$
	Solve for $\boldsymbol{a}$	•2 $\boldsymbol{a = 2}$
	Solve for $\boldsymbol{b}$	•3 $\boldsymbol{b\ = 50}$
3 (b)	Finding U_1	•4 $190 = 2U_1 + 50$, $\boldsymbol{U_1 = 70}$ •5 $70 = 2U_0 + 50$, $\boldsymbol{U_2 = 10}$
4	Finding $f(g(x))$	•1 $\boldsymbol{(3x + 1)^2\ - 2}$
	Finding $g(f(x))$	•2 $\boldsymbol{3(x^2 - 2) + 1}$

Recurrence Relations Homework - Marking Scheme

4 (b)	Equating functions Rearranging Factorising Solution	•3 $\mathbf{9x^2 + 6x - 1 = 3x^2 - 5} + 16$ •4 $\mathbf{6x^2 + 6p - 12 = 0}$ •5 $\mathbf{(x-1)(x+2) = 0}$ •6 $\boldsymbol{x = 1 \ and \ x = -2}$
5	Rearranging Undoing **cos** Further partial solution First two solutions for $\boldsymbol{x}$ Further two solutions	•1 $\mathbf{\cos\left(2x - \frac{\pi}{4}\right) = \frac{1}{2}}$ •2 $\mathbf{2x - \frac{\pi}{4} = \frac{\pi}{3}, \frac{5\pi}{3}}$ •3 $\mathbf{\frac{7\pi}{3}, \frac{11\pi}{3}}$ •4 $\mathbf{x = \frac{7\pi}{24}, \frac{23\pi}{24}}$ •5 $\mathbf{\frac{31\pi}{24}, \frac{47\pi}{24}}$

Total 26 marks