| Question | Answer | Marks | Partial marks |
|---|---|---|---|
| 6 | **Alternative method** | | |
| | $a = \frac{3}{x-1}$ oe or $x = \frac{a+3}{a}$ | **(2)** | **M1** for $2ax - 5$ |
| | $\left(\frac{6}{x-1}+1\right)x-10=\left(\frac{3}{x-1}\right)x^2-5x+2$ oe<br>or<br>$(2a+1)\left(\frac{a+3}{a}\right)-10=a\left(\frac{a+3}{a}\right)^2-5\left(\frac{a+3}{a}\right)+2$<br>oe | **(M1)** | **FT** *their a* of the form $\frac{k}{bx+c}$ where *k*, *b*, *c* are non-zero constants<br>or *their x* of the form $\frac{da+e}{fa}$ where *d*, *e*, *f* are non-zero constants |
| | $3x^2 - 12x + 12$ [= 0] oe or $a^2 - 6a + 9$ [= 0] | **(A1)** | |
| | Solves *their* 3-term quadratic in *x* as far as *x* = ... or factorises or solves *their* 3-term quadratic in *a* | **(M1)** | |
| | $a = 3$ | **(A1)** | |
| 7(a) | $20\cos 2t + 12\sin 2t$ | **2** | **B1** for $20\cos 2t$ or $12\sin 2t$ |
| 7(b) | 12 | **B1** | |
| 7(c) | $\tan 2t = their\left(-\frac{20}{12}\right)$ oe | **M1** | **FT** $a\cos 2t + b\sin 2t$ where *a* and *b* are non-zero integers |
| | $t = 1.06$ or $1.055[60\ldots]$ rot to 3 or more dp | **A2** | **A1** for $2t = -1.030[3\ldots]$ or $2t = 2.111[2\ldots]$ |
| 7(d) | $s = -5\cos 2t - 3\sin 2t$ (+ *c*) | **B2** | **B1** for $-5\cos 2t$ or $-3\sin 2t$ |
| | $-5\cos\pi - 3\sin\pi - (-5\cos\frac{\pi}{2} - 3\sin\frac{\pi}{2})$<br><br>or $s = -5\cos 2t - 3\sin 2t + 5$<br>and $s_{\frac{\pi}{2}} - s_{\frac{\pi}{4}} = 10 - 2$ | **M1** | **FT** providing at least **B1** previously awarded |
| | 8 | **A1** | |

| Question | Answer | Marks | Partial marks |
|---|---|---|---|
| 8 | $\left(2-\sqrt{10}\right)\left(2+\sqrt{10}\right)=-6$ | **B1** | |
| | $x=\dfrac{-1\pm\sqrt{1^{[2]}-4(2-\sqrt{10})(2+\sqrt{10})}}{2\left(2-\sqrt{10}\right)}$ | **M1** | |
| | $x=\dfrac{-1\pm\sqrt{1-4(-6)}}{2\left(2-\sqrt{10}\right)}$ | **A1** | |
| | $\dfrac{-6}{2\left(2-\sqrt{10}\right)}$ oe , $\dfrac{4}{2\left(2-\sqrt{10}\right)}$ oe | **A1** | |
| | $\dfrac{-6}{2\left(2-\sqrt{10}\right)}\times\dfrac{\left(2+\sqrt{10}\right)}{\left(2+\sqrt{10}\right)}$ or $\dfrac{4}{2\left(2-\sqrt{10}\right)}\times\dfrac{\left(2+\sqrt{10}\right)}{\left(2+\sqrt{10}\right)}$ | **M1** | **FT** $\dfrac{k}{2\left(2-\sqrt{10}\right)}$ where $k$ is a non-zero constant |
| | $\dfrac{-6(2+\sqrt{10})}{2(-6)}$ oe = $1+\dfrac{1}{2}\sqrt{10}$ | **A1** | Must have sufficient detail shown |
| | $\dfrac{4(2+\sqrt{10})}{2(-6)}$ oe = $-\dfrac{2}{3}-\dfrac{1}{3}\sqrt{10}$ | **A1** | Must have sufficient detail shown |
| 9(a) | $2(e^x + 1)^2 - 1$ [= 8] | **M1** | |
| | $e^x = -1+\sqrt{\dfrac{9}{2}}$ oe | **A1** | |
| | $x=\ln\left(\dfrac{3}{\sqrt{2}}-1\right)$ isw or 0.115 or 0.1145[06…] rot to 4 or more dp | **A1** | |
| 9(b) | f is not one-one, hence $f^{-1}$ does not exist oe | **B1** | |
| | $g^{-1}(x) = \ln(x - 1)$ | **2** | **M1** for $x = \ln(y - 1)$ and a swop of variables at some point<br>or $y = \ln(x + 1)$<br>or $e^x = y - 1$ and $y = \ln x - 1$ |
| | $x > 1$ | **B1** | |