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<td>MATHEMATICS (Pure 2)</td>
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1 EITHER: State or imply non-modular inequality $(x + 2)^2 < (5 - 2x)^2$, or corresponding equation B1
    Expand and make reasonable solution attempt at 2- or 3-term quadratic, or equivalent M1
    Obtain critical values 1 and 7 A1
    State correct answer $x < 1$, $x > 7$ A1

OR: State one correct equation for a critical value e.g. $x + 2 = 5 - 2x$ M1
    State two relevant equations separately e.g. $x + 2 = 5 - 2x$ and $x + 2 = -(5 - 2x)$ A1
    Obtain critical values 1 and 7 A1
    State correct answer $x < 1$, $x > 7$ A1

OR: State one critical value (probably $x = 1$), from a graphical method or by inspection or by solving a linear inequality B1
    State the other critical value correctly B2
    State correct answer $x < 1$, $x > 7$ B1 4

[The answer $7 < x < 1$ scores B0.]

2 (i) EITHER: Substitute $-2$ for $x$ and equate to zero M1
    Obtain answer $a = 7$ A1

OR: Carry out complete division and equate remainder to zero M1
    Obtain answer $a = 7$ A1 2

(ii) EITHER: Find quadratic factor by division or inspection M1
    Obtain answer $3x^2 + x - 4$ A1
    Factorise completely to $(x + 2)(x - 1)(3x + 4)$ A1

[To earn the M1 the quotient (or factor) must contain $3x^2$ and another term, at least.]

OR: State $(x - 1)$ is a factor B1
    Find remaining linear factor by division or by inspection M1
    Factorise completely to $(x + 2)(x - 1)(3x + 4)$ A1 3

3 State or imply the relation $\ln y = \ln A + x \ln x$ B1
    State or imply $\ln A = 2.3$ B1
    Obtain answer $A = 9.97$ B1 1
    Calculate gradient of the given line M1
    Obtain answer $n = -0.15$ A1 5

4 (i) State answer $R = \sqrt{13}$ B1
    Use trig formula to find $\alpha$ M1
    Obtain answer $\alpha = 33.7^\circ$ A1 3

(ii) Carry out, or indicate need for, evaluation of $\cos^{-1}(3.5/\sqrt{13})$ ($= 13.9^\circ$) M1
    Obtain answer $47.6^\circ$ A1
    Carry out correct method for second answer M1
    Obtain second answer $19.3^\circ$ A1 4

(iii) State coordinates $(33.7, \sqrt{13})$, or equivalent B1 1
5 (i) Obtain a derivative of the form $ke^{-x} + k' e^{-x}$ where $kl \neq 0$
Obtain correct derivative $2e^{-x} - 2x e^{-x}$, or equivalent
Equate $\frac{dy}{dx}$ to zero and solve for $x$
Obtain coordinates $(1, 2e^{-1})$ for $P$
(ii) State that $\frac{1}{2} = 2x e^{-x}$ and deduce the given answer correctly
(iii) State or imply that $x_1 = 0.25$
Continue the iteration correctly
Obtain final answer 0.36 after sufficient iterations to justify its accuracy to 2(d.p.), or after showing there is a sign change in (0.355, 0.365)

6 (a) (i) State indefinite integral $k \sin 2x$ and use limits
Obtain given answer correctly
(ii) Use double-angle formula to convert integrand to the form $\sin \theta \cos 2\theta$, where $a \neq 0$
Integrate and use limits (both terms)
Obtain answer $\frac{1}{4}(\pi - 2)$, or equivalent
(b) (i) Show or imply correct ordinates 1, 1.08239..., $\sqrt{2}$ (1.41421...)
Use correct formula, or equivalent, with $a = \pi/8$ and three ordinates
Obtain correct answer 0.90 with no errors seen
(ii) Make a correct relevant sketch of $y = \sec x$
State that the rule gives an over-estimate

7 (i) State $\frac{dx}{dt} = 1 + \frac{2}{t^2}$, $\frac{dy}{dt} = 2 - \frac{1}{t}$
Use $\frac{dy}{dx} = \frac{dy}{dt} \frac{dt}{dx}$
Obtain $\frac{dy}{dx}$ in any correct form e.g. $\frac{2t - 1}{t + 2}$
(ii) Substitute $t = 1$ in $\frac{dy}{dx}$ and both parametric equations
Obtain $\frac{dy}{dx} = \frac{1}{3}$ and coordinates $(1, 2)$
Obtain equation $3y = x + 5$, or any 3-term equivalent
(iii) Equate $\frac{dy}{dt}$ to zero and solve for $t$
Obtain answer $t = \frac{1}{2}$
Obtain the given value of $y$ correctly
Show by any method that this is a minimum