Summary Method C4 (Jan '08)

1.

a)

Add the fractions in the second expression, multiply by k and compare directly to the first expression.

b)

Use the second expression (with your value of k) to write the integral as the sum of two linear fractions, then use the rule $\int \frac{f'(x)}{f(x)} dx = \ln(f(x)) + C$

2.

a)

i.

Recall that if $(ax + b)$ is a factor, $x = -\frac{b}{a}$ is a root, and $f\left(-\frac{b}{a}\right) = 0$.

ii.

Use long division or inspection to determine the quadratic factor. In general, start by examining the x^2 coefficient and the constant term.

iii.

Factorise the numerator ($4x$ is a common factor), factorise the denominator (you did this in part ii.), then simplify by cancelling any common factors.

b)

Write the two terms from the second expression with a common denominator, simplify then compare coefficients of the numerator with the first expression.

3.

a)

Use the binomial expansion formula from the formula book.

b)

Substitute $\frac{3}{2}x$ into your expansion wherever you see x. Note: this means x^2 becomes $\left(\frac{3}{2}x\right)^2$, not $\frac{3}{2}x^2$.

c)

Divide the top and bottom of the fraction within the square root by two, then write the square root of the numerator and denominator separately. This means you can use your expansion for the top part, simply dividing by the number you get on the bottom.

4.

a)

i.

Substitute in the formula the value of P at the start, along with $t = 0$. Note: this is the initial value.

ii.

Substitute the values for P and t from 1945, along with your value for A, and rearrange to find k.

iii.

Substitute the new value of P and rearrange to find t. Note: this will involve taking logs of both sides.

b)

Set $P = Q$ and take logs of both sides. Rearrange to solve for t.

5.
a)
i.
Substitute the value of t into both equations to find the x and y co-ordinates.
ii.
First calculate $\frac{dt}{dx}$ and $\frac{dt}{dy}$ then divide to produce an expression in t for $\frac{dy}{dx}$. Then substitute the value of t into this to find the gradient at that point on the curve. Use $y - y_1 = m(x - x_1)$ to write the equation.
b)
Find an expression in terms of t for $(x - y)$ and $(x + y)^2$, then multiply them. The t terms should all cancel out, leaving you with a constant (the integer k).

6.
Differentiate both sides with respect to x using implicit differentiation. Remember that $\frac{d(f(y))}{dx} = f'(y)\frac{dy}{dx}$. Then substitute the x and y coordinates given into this equation and solve for $\frac{dy}{dx}$.

7.
a)
i.
Recall that $R = \sqrt{a^2 + b^2}$ and use the formula book to write $\sin(\theta + \alpha)$ in terms of $\sin(\theta)$ and $\cos(\theta)$. Put this equal to the original expression you were given, and equate coefficients of $\sin(\theta)$ and $\cos(\theta)$.
ii.
Use your new form of the expression to solve for $\theta - \alpha$, remember to adjust your limits and give all solutions in the range (using the graph of cosine to help you).
b)
i.
Use the formula book $\sin(A + B)$ and $\cos(A + B)$ formulae to derive the double-angle formulae if not known, substitute these expressions into the left-hand side and simplify. Note: use the $\sin^2 x$ version of the $\cos 2x$ formula (or derive from $\sin^2 x + \cos^2 x = 1$).
ii.
Use the right-hand side of the previous identity, rearrange into a quadratic in $\tan x$, and solve using the graph.

8.
Multiply both sides by y, and move the dx to the RHS. Integrate both sides, remembering to include an arbitrary constant, and substitute the values of x and y given in the question to determine the value of the constant. Rewrite in the required form.

9.
a)
i.
Recall that $\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA}$ where $\overrightarrow{OA}$ is the position vector of the point A.
ii.
The position vector of your line equation can be any point on the line, so use $\overrightarrow{OA}$ or $\overrightarrow{OB}$. The direction vector can be any vector with the same direction of the line, so use $\overrightarrow{AB}$.
b)
i.
Write the vector equation of the line as a single vector (the general point), put this equal to P and construct a system of equations from this. If there is a consistent solution for μ, the point is on the line.