10 (a) An arithmetic progression has first term a and common difference d.

Given that $S_{20} = 3 \times S_{10}$, find a in terms of d. [3]

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(b) A geometric progression, A, has common ratio r, where $|r| < 1$.
The terms of this progression are $a_1, a_2, a_3 \ldots$.

Another geometric progression, B, has terms $b_1, b_2, b_3 \ldots$, where

$$b_1 = a_2, \quad b_2 = a_4, \quad b_3 = a_6 \ldots .$$

The sum to infinity of A is S_A and the sum to infinity of B is S_B.

Find $\frac{S_B}{S_A}$ in terms of r.

Give your answer in its simplest form. [5]

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11 The lines $x = 0$, $x = 4$, $y = 3$ and $y = -1$ are tangents to a circle.

(a) Find the equation of the circle. [3]

The line $y = 2x + a$, where a is a constant, is also a tangent to the circle.

(b) Show that $5x^2 + 4(a-2)x + (a-1)^2 = 0$, and hence find the possible values of a. Give your answers in exact form. [4]

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