10 Show that $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \left((\sin\theta+\cos\theta)^2+(\sin\theta-\cos\theta)^2\right)\mathrm{d}\theta = k\pi$, where k is an integer to be found. [5]

11 Solve the equation $(n-4)\,{}^{n+1}C_5 = {}^{n+2}C_7$. [3]

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12 A curve has equation $y = \dfrac{e^{(x^2)}}{x-2}$ for $x < 2$.

(a) Find the value of $\dfrac{dy}{dx}$ when $x = 0$. [4]

When $x = 0$, y is increasing at the rate of 0.5 units per second.

(b) Find the corresponding rate of change of x. [2]

Question 13 is printed on the next page.

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