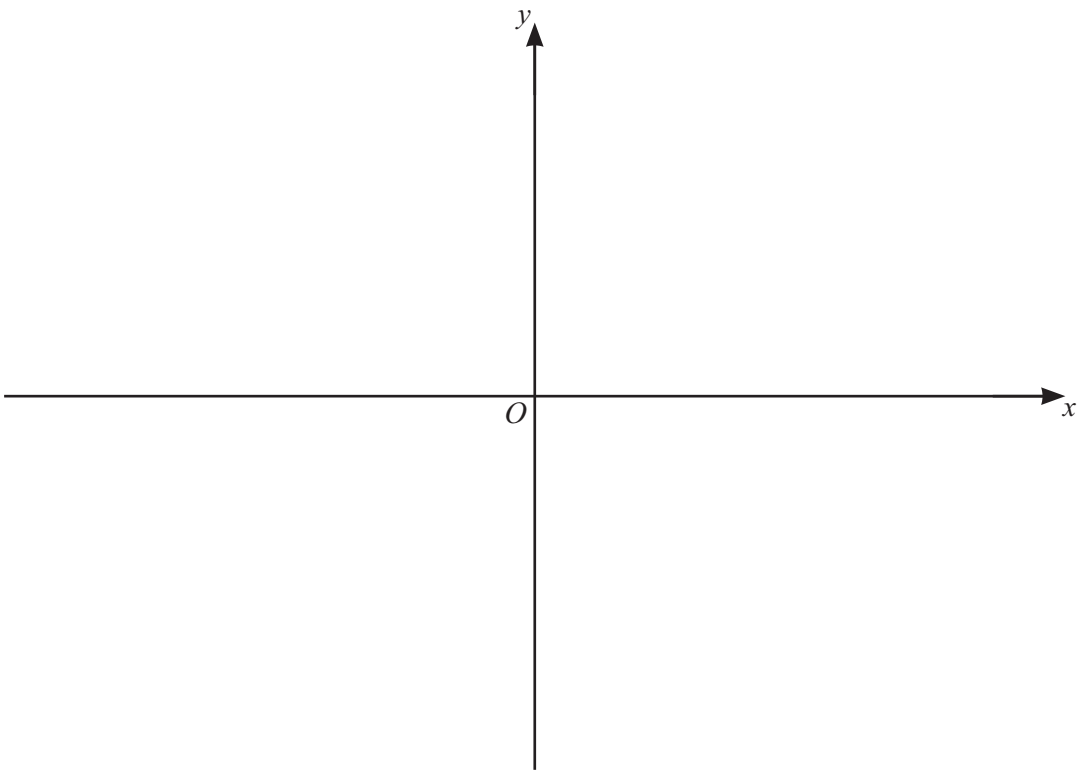
4 The function f is such that $\mathrm{f}(x) = 4\ln(3x-2)$, for $x > a$, where a is as small as possible.

(a) (i) Write down the value of a. [1]

(ii) Write down the range of f. [1]

(iii) Find $\mathrm{f}^{-1}(x)$, stating its domain and range. [4]

(iv) On the axes sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$, stating the intercepts with the axes. [4]



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(b) Given that $g(x) = (2x+1)^{\frac{1}{2}} + 4$, for $x > 0$, solve the equation $gg(x) = 9$. [3]

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5 **(a)** Show that $\dfrac{1+\cot^2\theta}{\cot^2\theta} = \sec^2\theta$. [1]

(b) Write down the derivative of $\tan\theta$ with respect to θ. [1]

(c) Using **part (a)** and **part (b)**, find the exact value of $\displaystyle\int_0^{\frac{\pi}{3}}\left(\frac{1+\cot^2\theta}{\cot^2\theta} - \sin\theta\right)\mathrm{d}\theta$. [4]

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