9 It is given that $\mathrm{f}(x) = 2\ln(3x-4)$, for $x > a$, and that f^{-1} exists.

(a) Find the least possible value of a. [1]

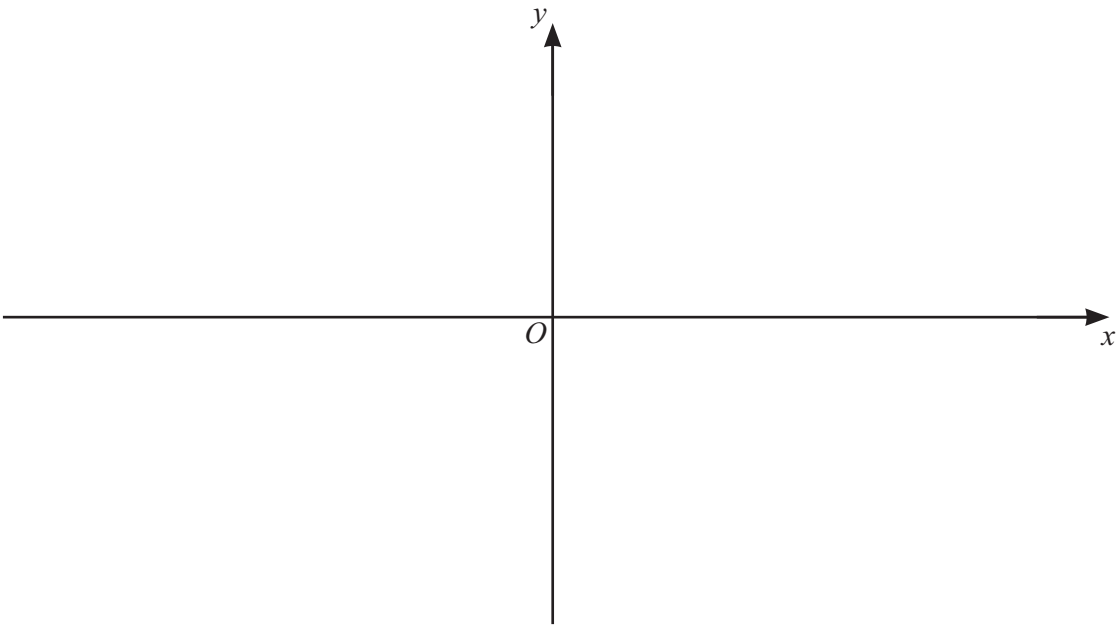
(b) For your value of a, find the range of f. [1]

(c) For your value of a, find an expression for $\mathrm{f}^{-1}(x)$. [2]

(d) It is given that the equation $\mathrm{f}(x) = \mathrm{f}^{-1}(x)$ has two roots.

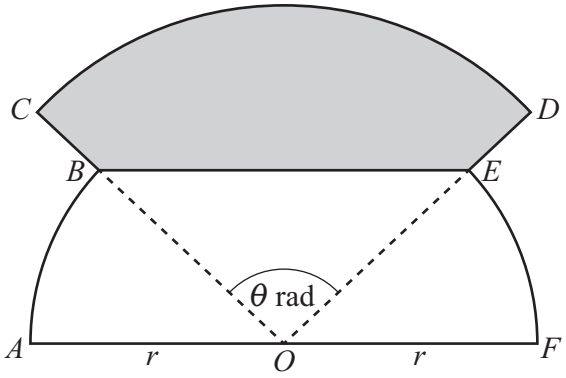
For your value of a, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$ on the axes.

Label each graph.
State the intercepts of each graph with the axes.
State the equations of any asymptotes. [4]



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10



The diagram shows the shape $OABCDEF$.
AOF is a straight line.
OAB and OEF are sectors of a circle with centre O and radius r.
Angle BOA = angle EOF.

OCD is a sector of a circle with centre O and radius $\frac{4r}{3}$.

Angle COD is θ radians.
The point B lies on the line OC and the point E lies on the line OD.
The line BE is parallel to the line AOF.

(a) Find, in terms of r and θ, the area of the shaded region $BCDE$. [3]

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