

Answer each question to the best of your abilities. Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Good luck!

1. (5 points) Let $f(x) = x^2 + 3$ and $g(x) = 2x + 1$. Find $(f \circ g)(x)$ and $(g \circ f)(x)$.

$$\begin{aligned}(f \circ g)(x) &= f(g(x)) \\ &= f(2x+1) \\ &= (2x+1)^2 + 3\end{aligned}$$

$$(f \circ g)(x) = 4x^2 + 4x + 4$$

$$\begin{aligned}(g \circ f)(x) &= g(f(x)) \\ &= g(x^2+3) \\ &= 2(x^2+3) + 1\end{aligned}$$

$$(g \circ f)(x) = 2x^2 + 7$$

2. (5 points) Let $f(x) = \frac{4x-1}{2x+3}$. Is f invertible? If so, find its inverse. If not, explain why it is not.

Yes!

$$y = \frac{4x-1}{2x+3}$$

$$y(2x+3) = 4x-1$$

$$2xy + 3y = 4x - 1$$

$$2xy - 4x = -1 - 3y$$

$$x(2y-4) = -1-3y$$

$$x = \frac{-1-3y}{2y-4}$$

$$f^{-1}(x) = \frac{-1-3x}{2x-4}$$

3. (5 points) Solve for x :

$$e^{2x+3} - 7 = 0.$$

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$$e^{2x+3} = 7 \iff 2x+3 = \ln 7$$

$$2x = \ln 7 - 3$$

$$x = \frac{1}{2}(\ln 7 - 3)$$