

## Eighth set of Homework

Nikos Apostolakis

**Please note:** You should fully justify your answers.

### Exponential and logarithmic functions

1. Simplify the following expressions. All variables are assumed positive:

(a)  $\log_4 8$

(b)  $\log_3 \frac{1}{27}$

(c)  $\ln e^{36} - e^{\ln 6} + \ln e^{12}$

(d)  $\log 0.0001$

(e)  $\log_b b^{42}$

(f)  $3^{\log_3(3+\sqrt{2x})}$

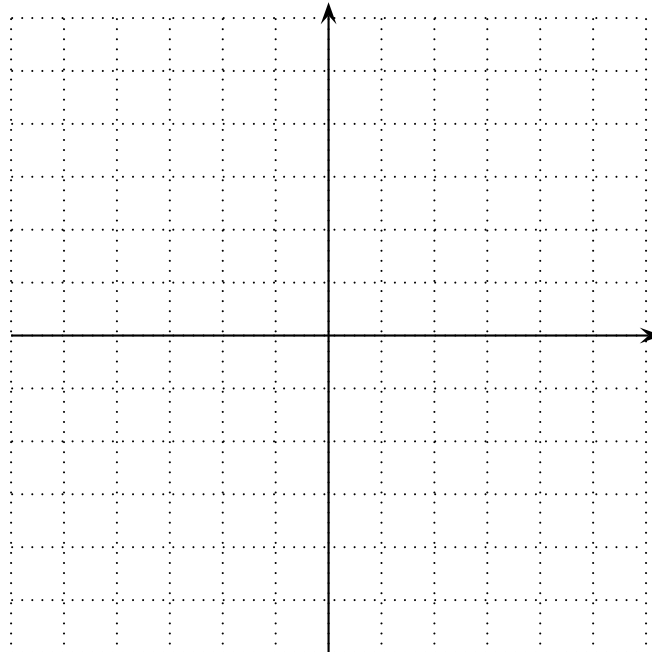
(g)  $e^{\ln 7x^3}$

(h)  $\log_{42} 1$

2. Consider the following pair of functions:

$$f(x) = \log_2(x + 3) - 2, \quad g(x) = 2^{x+2} - 3$$

(a) Graph these functions on the same set of axes. What do you observe?



(b) Find the domain and the range of  $f$  and  $g$ .

(c) Find  $f \circ g$  and  $g \circ f$ . Does this confirm your observation in part (a)?

3. Find the domain of the following functions:

(a)  $f(x) = \ln(3x - 5)$

(b)  $g(x) = \log(x^2 + 4x + 4)$

(c)  $h(x) = \log_3(x^3 - 6x^2 + 11x - 6)$

(d)  $f(x) = \log_{42}\left(\frac{x-2}{x+1}\right)$