

## Math 141 HW#1

1. False

Counterexample: let  $f(x) = x + 1$

$$f(s+t) = s+t+1$$

$$f(s) + f(t) = (s+1) + (t+1) \\ = s+t+2.$$

2. False

Counterexample: let  $f(x) = |x|$

$$f(-s) = f(s) = s \quad (s \neq 0).$$

3. False

Counterexample: let  $f(x) = x^2$

$$f(3x) = (3x)^2 = 9x^2$$

$$\exists f(x) = 3x^2$$

4. True By definition, pg 21

5. True Vertical line test, pg 17

6. False (pg 44)

Counterexample: let  $f(x) = x^2$ ,  $g(x) = -x$ .

$$(f \circ g)(x) = f(g(x)) = (-x)^2 = x^2$$

$$(g \circ f)(x) = g(f(x)) = -(x^2) = -x^2$$

7. False (pg 64-65)

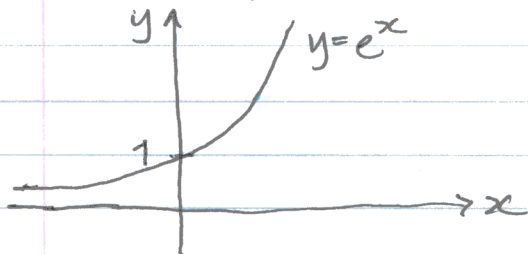
one-to-one:  $x_1 \neq x_2$  implies  $f(x_1) \neq f(x_2)$ .

Counterexample: let  $f(x) = x$ .

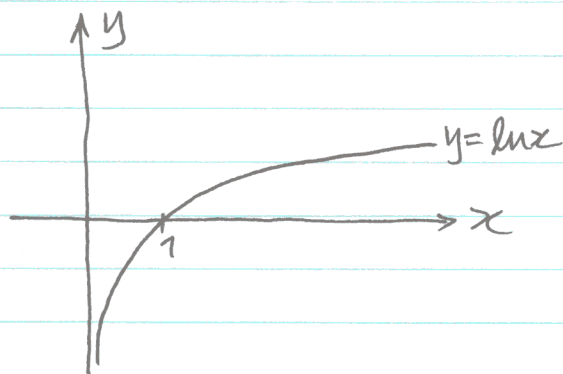
$$\therefore f^{-1}(x) = x \neq \frac{1}{f(x)} = \frac{1}{x}.$$

8. True

For all  $x$ ,  $e^x \neq 0$ .  $\therefore \frac{n}{e^x}$  is defined for all  $n$  and  $x$ .



9. True



10. False

Counterexample:  $(\ln e)^6 = 1^6 = 1$   
 $6 \ln e = 6 \cdot 1 = 6.$

pg 68:  $\ln(x^a) = a \ln x$

11. False

Counterexample:  $\frac{\ln e}{\ln e} = 1 \neq \ln \frac{e}{e} = \ln 1 = 0.$

pg 68:  $\ln\left(\frac{x}{a}\right) = \ln x - \ln a \quad (x > 0, a > 0)$