

Math 135:04, Quiz #1
Jan. 31, 2002

10 points
Show all work!

Name _____

Let $f(x) = x^2 - 1$ and $g(x) = \sqrt{x+1}$. Find the following:

1. (1 pt.) $(f \circ g)(3)$

Solution:

$$(f \circ g)(3) = f(g(3)) = f(\sqrt{3+1}) = f(2) = 2^2 - 1 = 3.$$

2. (2 pts.) the domain of g

Solution:

The function \sqrt{x} is defined whenever $x \geq 0$. Thus, g is defined when $x+1 \geq 0$, or when $x \geq -1$. As a subset of the real line, the domain of g is $[-1, \infty)$.

3. (4 pts.) the domain of $\frac{g}{f}$

Solution:

The domain of g/f is the intersection of the domains of g and f , minus the points x where $f(x) = 0$. The domain of g is $[-1, \infty)$ from above, and the domain of f is the entire real line $(-\infty, \infty)$. Factoring, we see that

$$f(x) = x^2 - 1 = (x-1)(x+1) = 0 \text{ when } x = 1 \text{ or } x = -1.$$

Thus, the domain of g/f is $(-1, 1) \cup (1, \infty)$.

4. (3 pts.) Find and simplify $\frac{f(a+h)-f(a)}{h}$, where $h \neq 0$.

Solution:

$$\frac{f(a+h) - f(a)}{h} = \frac{((a+h)^2 - 1) - (a^2 - 1)}{h} = \frac{2ah + h^2}{h} = 2a + h.$$