

Math 140, Section 5  
Quiz #4

February 2, 2001  
SOLUTIONS

Let  $y = f(x) = \frac{x}{x^2 - 1}$ .

1. Calculate  $f'(x)$  and  $f'(-2)$  and  $\frac{dy}{dx}$  and  $\frac{dy}{dx}\Big|_{x=-2}$ .

Simplify your answers as much as possible.

*Solution.*

$$f'(x) = \frac{dy}{dx} = \frac{(x^2 - 1)(1) - (x)(2x)}{(x^2 - 1)^2} = \frac{-x^2 - 1}{(x^2 - 1)^2}.$$

$$f'(-2) = \frac{dy}{dx}\Big|_{x=-2} = \frac{-(-2)^2 - 1}{((-2)^2 - 1)^2} = \frac{-4 - 1}{(4 - 1)^2} = -\frac{5}{9}.$$

2. Explain the meaning of  $f'(-2)$  in terms of tangent lines, etc.

*Solution.* We have

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

and  $f'(-2) = -5/9$ . Thus  $(-2, -2/3)$  is a point on the graph of  $y = f(x)$ , and  $-5/9$  is the slope of the tangent line at this point.