Math 229 Section 10 Quiz #1 Solutions

1. Evaluate the difference quotient for

$$f(x) = x^3, \qquad \frac{f(a+h) - f(a)}{h}$$

and simplify your answer.

Here $f(a+h) = (a+h)^3 = a^3+3a^2h+3ah^2+h^3$ and $f(a) = a^3$, so $f(a+h)-f(a) = 3a^2h+3ah^2+h^3$ and the difference quotient is

$$\frac{3a^2h + 3ah^2 + h^3}{h} = 3a^2 + 3ah + h^2.$$

2. Write an equation for the line passing through $(1, 2)$ that is parallel to the line given by $2x-3y = 1$.

Rewriting the given line's equation gives $3y = 2x - 1$, and solving for y gives $y = \frac{2}{3}x - \frac{1}{3}$. From this equation we can easily see the slope here is $2/3$. Since parallel lines have the same slope, we need and equation for the line through $(1, 2)$ with slope $2/3$. The simplest way to proceed here is to use point-slope form:

$$(y - 2) = \frac{2}{3}(x - 1).$$

3. Express the function $G(x) = \sqrt[3]{\dfrac{x}{1+x}}$ in the form $f \circ g$.

This is a composition of the cube root function, $f(x) = \sqrt[3]{x}$, and the function $g(x) = \frac{x}{1+x}$.