Math 141A: Assessment

1. Consider the following function

$$y = \frac{2x^2}{x^2 - 1}$$

   (a) What is the domain and range of the function?

   (b) What are the intercepts?

   (c) Any symmetry and periodicity?

   (d) Asymptotes?

2. Let $y = f(x) = ax^2 + bx + c$ be a quadratic with $a \neq 0$. Suppose it has two roots r_1 and r_2 with $r_1 < r_2$. From first principles and without using any calculus, show that the max or min value of the polynomial occurs exactly at the halfway point between the two roots. i.e.

$$r_m = \frac{r_1 + r_2}{2}$$

   where $f(x) < f(r_m)$ for all $x \in \text{dom}(f)$ or $f(x) > f(r_m)$ for all $x \in \text{dom}(f)$.