

Name: _____

Student Number: _____

Answer all questions and show all your work. No calculators allowed. (Total Marks: 30).
You have 20 minutes to complete the quiz.

- [4] 1. Sketch the graph of any function that has no vertical asymptotes but also has no absolute max **and** no absolute min.
- [4] 2. Is it possible for a function $f(x)$ to be such that for all $x < 0$, $f(x) > 0$, $f'(x) > 0$, and $f''(x) > 0$?
If so, **find an equation** for such a function and **show that it satisfies all these conditions**.
If no such function exists, explain and justify why it doesn't exist.
- [10] 3. Sketch one continuous curve $y = f(x)$ that satisfies all of the following properties (at the same time):
- $f(2) = 4$
 - when $x < 2$, $f''(x) > 0$
 - when $x > 2$, $f''(x) < 0$
 - $\lim_{x \rightarrow 2^-} f'(x) = \infty$
 - $\lim_{x \rightarrow 2^+} f'(x) = \infty$

- [12] 4. A piece of wire 34m long is cut into two pieces. One piece is bent into a square and the other is bent into a rectangle whose length is twice as long as its width (that is, its long side is twice as long as its short side). How should the wire be cut so that the total area enclosed (by the square and the rectangle together) is a **minimum**.