Name:_____ Quiz Score:____/20

Student Number:_____

Answer questions in the space provided. Show your work.

1.

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

(a) (2 points) For $|x| << 1$, $f(x) \approx cx^n$ with constant c and integer n. What are c and n?

(b) (2 points) For $|x| >> 1$, $f(x) \approx cx^n$ with constant c and integer n. What are c and n?

(c) (2 points) Determine $\lim_{x \to 0} f(x)$.

(d) (2 points) Determine $\lim_{x\to 1} f(x)$.

(e) (2 points) Determine $\lim_{x\to \infty} f(x)$.

(f) (2 points) In a solid line, sketch the graph of $f(x)$ for small x ($|x| << 1$) and for large x ($|x| >> 1$). Based solely on the continuity of $f(x)$, fill in the remainder of your sketch with a dashed line. [Do not determine precise behaviour of f(x): zeros, minimums, maximums, or inflection points]

2. (a) (4 points) For a differentiable function $f(x)$, what is the definition of $f'(x)$ in the form of a limit?

(b) (4 points) For $f(x) = x^2 + x + 1$, determine $f'(x)$ from the limit definition of the derivative.