

You have 20 minutes to complete the quiz. No calculators.

Name: _____

1. (2 points) Write down the equation for the line tangent to the curve $f(x) = 3x^2 - 2x$ at $x = 1$.

2. (3 points) Define

$$f(x) := \frac{3x^3 - 2x^2 - 5}{x^3 - 8}.$$

(a) Using the fact that $\lim_{x \rightarrow \infty} \frac{1}{x^n} = 0$ for $n > 0$, compute $\lim_{x \rightarrow \infty} f(x)$.

(b) What are the horizontal and vertical asymptotes of f ?

(c) Recall the definition for limits as $x \rightarrow \infty$: We say that $\lim_{x \rightarrow \infty} f(x) = L$ if and only if for every $\epsilon > 0$ there is some $M \geq 0$ such that whenever $x > M$ it follows that $|f(x) - L| < \epsilon$. Using the definition, prove that $\lim_{x \rightarrow \infty} \frac{1}{x^n} = 0$ for n a positive integer (i.e. n can be $1, 2, \dots$). Start by finding M for a given ϵ and n .