Math 131 - Quiz 11

November 29, 2023

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) State the horizontal asymptote for the graph of each rational function. You don't need to show work.

   (a) $R(x) = \dfrac{3 - 8x^2 - 9x^4}{7x^4 + x^3 + 4x^2}$ $\quad y = -\frac{9}{7}$

   (b) $f(x) = \dfrac{x^3 - 2x}{x^3 - 5x}$ $\quad y = 1$

   (c) $h(x) = \dfrac{1000x^5 + 100}{x^6 + 1}$ $\quad y = 0$

2. (2 points) Explain very briefly how you know that the graph of $Q(x) = \dfrac{x^3 + x}{256x^2 + 512x + 1024}$ has no horizontal asymptote.

   Q(x) IS A RATIONAL FUNCTION WITH DEGREE OF NUMERATOR GREATER THAN DEGREE OF DENOMINATOR.

3. (5 points) Use any analytical method to compute each limit.

   (a) $\lim_{x\to\infty} \dfrac{e^x}{x^2}$ $\quad \infty/\infty$

   $= \lim_{x\to\infty} \dfrac{e^x}{2x}$ $\quad \infty/\infty$ $= \lim_{x\to\infty} \dfrac{e^x}{2} = \infty$ $\quad$ L'HOPITAL'S RULE TWICE.

   (b) $\lim_{x\to 0^+} \dfrac{\ln x}{1/x}$ $\quad -\infty/\infty$

   $= \lim_{x\to 0^+} \dfrac{\frac{1}{x}}{-\frac{1}{x^2}} = \lim_{x\to 0^+} \dfrac{-x^2}{x} = \lim_{x\to 0^+} (-x) = 0$

   L'HOPITAL'S RULE $\quad$ ALGEBRA.