VER 1

MATH 113 – QUIZ 3 – 18 SEPTEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) Let $g(x) = \dfrac{x^2 - 2x - 3}{3x^2 - x - 6}$. Evaluate $\lim_{x\to\infty} g(x)$ and $\lim_{x\to-\infty} g(x)$. Then give the horizontal asymptote of g.

$$\lim_{x\to\infty} \frac{x^2-2x-3}{3x^2-x-6} = \lim_{x\to\infty} \frac{x^2}{3x^2} = \lim_{x\to\infty} \frac{1}{3} = \frac{1}{3}$$

OR

$$\lim_{x\to\infty} \frac{x^2-2x-3}{3x^2-x-6} = \lim_{x\to\infty} \frac{(x^2-2x-3)\frac{1}{x^2}}{(3x^2-x-6)\frac{1}{x^2}} = \lim_{x\to\infty} \frac{1-\frac{2}{x}-\frac{3}{x^2}}{3-\frac{1}{x}-\frac{6}{x^2}} = \frac{1}{3}$$

$$\lim_{x\to-\infty} \frac{x^2-2x-3}{3x^2-x-6} = \frac{1}{3} \text{ also}$$

Horizontal asymptote: $y = \frac{1}{3}$

2. (5 pts.) Determine whether the function $f(t) = \begin{cases} \dfrac{t+1}{t^2+t} & \text{if } t \neq -1 \\ -1 & \text{if } t = -1 \end{cases}$ is continuous at $t = -1$. Explain your answer.

Check: $\lim_{t\to-1} f(t) = f(-1)$?

$$\lim_{t\to-1} f(t) = \lim_{t\to-1} \frac{t+1}{t^2+t} = \lim_{t\to-1} \frac{\cancel{t+1}}{t(\cancel{t+1})} = \lim_{t\to-1} \frac{1}{t} = -1$$

$f(-1) = -1$. Since $\lim_{t\to-1} f(t) = f(-1)$, f is continuous at $t=-1$.

VER 2

MATH 113 – QUIZ 3 – 18 SEPTEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) Let $f(t) = \frac{t^2 - t}{2t^2 + t}$. Evaluate $\lim_{t \to \infty} f(t)$ and $\lim_{t \to -\infty} f(t)$. Then give the horizontal asymptote of f.

$$\lim_{t \to \infty} \frac{t^2 - t}{2t^2 + t} = \lim_{t \to \infty} \frac{t^2}{2t^2} = \lim_{t \to \infty} \frac{1}{2} = \frac{1}{2}$$

OR $$\lim_{t \to \infty} \frac{(t^2 - t)\frac{1}{t^2}}{(2t^2 + t)\frac{1}{t^2}} = \lim_{t \to \infty} \frac{1 - \frac{1}{t}}{2 + \frac{1}{t}} = \frac{1}{2}$$

Also, $\lim_{t \to -\infty} \frac{t^2 - t}{2t^2 + t} = \frac{1}{2}$.

Horizontal asymptote: $y = \frac{1}{2}$

2. (5 pts.) Determine whether the function $g(x) = \begin{cases} \frac{x^2 - 1}{x^3 + x^2} & \text{if } x \neq -1 \\ -2 & \text{if } x = -1 \end{cases}$ is continuous at $x = -1$. Explain your answer.

Check: $\lim_{x \to -1} f(x) = f(-1)$?

$$\lim_{x \to -1} f(x) = \lim_{x \to -1} \frac{x^2 - 1}{x^3 + x^2} = \lim_{x \to -1} \frac{\cancel{(x+1)}(x-1)}{x^2\cancel{(x+1)}} = \lim_{x \to -1} \frac{x-1}{x^2} = -2$$

$f(-1) = -2$. Since $\lim_{x \to -1} f(x) = f(-1)$, f is continuous at $x = -1$.

VER 3

MATH 113 – QUIZ 3 – 18 SEPTEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) Let $f(t) = \dfrac{t^2-1}{t^3+t}$. Evaluate $\lim_{t\to\infty} f(t)$ and $\lim_{t\to-\infty} f(t)$. Then give the horizontal asymptote of f.

$$\lim_{t\to\infty} \frac{t^2-1}{t^3+t} = \lim_{t\to\infty} \frac{t^2}{t^3} = \lim_{t\to\infty} \frac{1}{t} = 0 //$$

OR

$$\lim_{t\to\infty} \frac{(t^2-1)(\frac{1}{t^3})}{(t^3+t)(\frac{1}{t^3})} = \lim_{t\to\infty} \frac{\frac{1}{t}-\frac{1}{t^3}}{1+\frac{1}{t^2}} = \frac{0}{1} = 0 //$$

Also $\lim_{t\to-\infty} \frac{t^2-1}{t^3+t} = 0$. Horizontal asymptote:

$y=0$ //

2. (5 pts.) Determine whether the function $g(x) = \begin{cases} \dfrac{x^2-2x-3}{x^2-x-6} & \text{if } x \neq 3 \\ 0 & \text{if } x = 3 \end{cases}$ is continuous at $x=3$. Explain your answer.

Check! $\lim_{x\to 3} f(x) = f(3)$?

$$\lim_{x\to 3} f(x) = \lim_{x\to 3} \frac{x^2-2x-3}{x^2-x-6} = \lim_{x\to 3} \frac{(x+1)\cancel{(x-3)}}{(x+2)\cancel{(x-3)}}$$

$$= \lim_{x\to 3} \frac{x+1}{x+2} = \frac{4}{5}. \quad f(3) = 0.$$

Since $\lim_{x\to 3} f(x) \neq f(3)$, <u>f is not continuous at $x=0$.</u>