MATH 161: Quiz 4

Name: key

Directions:

- Show your thought process (commonly said as "show your work") when solving each problem for full credit.
- If you do not know how to solve a problem, try your best and/or explain in English what you would do.
- Good luck!

Find the following limits:

1. $\lim_{x\to 4}\sqrt{\frac{x^2}{x+5}}$

$$= \sqrt{\frac{\lim_{x\to 4} x^2}{\lim_{x\to 4} x + \lim_{x\to 4} 5}}$$

limit law 10, 5, then 1

$$= \sqrt{\frac{4^2}{4+5}}$$

limit law 6, 7, 8

$$= \sqrt{\frac{16}{9}} = \boxed{\frac{4}{3}}$$

2. $\lim_{h\to 0}\dfrac{\frac{1}{1+h}-1}{h}$

Try limit laws:

$$\frac{\lim_{h\to 0} 1}{\lim_{h\to 0} 1 + \lim_{h\to 0} h} - \lim_{h\to 0} 1$$

$$\lim_{h\to 0} h$$

$$= \frac{\frac{1}{1}-1}{0} = \frac{0}{0}$$

not done!

create global factor of h in numerator!

$$\lim_{h\to 0}\frac{\frac{1}{(1+h)} - 1\cdot\frac{1+h}{1+h}}{h} = \lim_{h\to 0}\frac{\frac{1}{1+h} - \frac{1+h}{1+h}}{h}$$

$$= \lim_{h\to 0}\frac{\frac{1-(1+h)}{1+h}}{h}$$

$$= \lim_{h\to 0}\frac{\frac{1-1-h}{1+h}}{h}$$

$$= \lim_{h\to 0}\frac{\frac{-h}{1+h}}{h}$$

$$= \lim_{h\to 0} -\frac{\cancel{h}}{1+h}\cdot\frac{1}{\cancel{h}}$$!!

$$= \lim_{h\to 0} -\frac{1}{1+h} = -\frac{1}{1+0} = \boxed{-1}$$

3. Draw the graph of a function which satisfies the following:

   (a) $f(0) = 0$

   (b) $f(2) = 3$

   (c) $\lim_{x \to 0} f(x) = 1$

   (d) $\lim_{x \to 2^-} f(x) = 0$

   (e) $\lim_{x \to 2^+} f(x) = 2$

   (f) $\lim_{x \to -2} f(x) = -\infty$

Answers may vary.