Directions: Please answer the following questions and make sure your answer are legible. You must show your work to receive credit for your answers. You may not use a calculator (or any other technology) on this quiz. Good Luck.

1. (7 points) For \( f(x) = \frac{x^3 + 2x^2 + x}{x^2 - x - 2} \) (4.1 #11)
   
   (a) Find the domain of \( f \).
   
   (b) Find the vertical and horizontal asymptotes of \( y = f(x) \) (or indicate there are none).

   \[
   \frac{f(x)}{x} = \frac{x(x^2 + dx + e)}{x^2 - x - 2} = \frac{x(x+1)^3}{(x-3)(x+1)} \Rightarrow \text{sim} f(x) = \frac{x(x+1)}{x-2} \quad \text{as } x \to \pm \infty \quad x 
   
   \text{Domain: } (-\infty, -1) \cup (-1, 2) \cup (2, \infty)
   
   \underline{VA} x = -1 \quad \underline{Hole} (-1, 0)
   
   \underline{HA} \quad \text{none}
   
2. (6 points) Graph the rational function \( h(x) = \frac{-2x+1}{x} \) by applying transformations to the graph of \( y = \frac{1}{x} \). (Hint: divide) (4.2 #19)

   \[
   h(x) = \frac{-2x+1}{x} = -2 + \frac{1}{x} \quad \text{for } \delta(t) = \frac{1}{x}
   
   h(x) = f(x) - 2
   
   \text{There is another question on the back}
3. (12 points) (4.2 #10)

Graph the rational function \( f(x) = \frac{3x^2 - 5x - 2}{x^2 - 9} \). Draw asymptotes as dashed lines.

Make sure to clearly indicate all the information you should be finding using the six step process.

\[
\frac{f(x)}{(x + 3)(x - 3)} \leftarrow \text{this is as simple as it gets}
\]

- Domain: \((-\infty, -3) \cup (-3, 3) \cup (3, \infty)\)
- \(x\) int: \((-\frac{1}{3}, 0) \& (2, 0)\)
- \(y\) int: \((0, \frac{1}{3})\)

- \(VA: x = 3, x = -3\)
- Holes: None
- \(HA: y = \frac{3}{7}\)

\[
\begin{array}{c|c|c|c}
\text{Roots/} & \text{VA/Hole} & \text{\(f(-1)\)} & \text{\(f(2.5)\)} \\
\hline
x = -3 & VA & \text{(-)(-) \& (y)(-)} & \text{(+)(-)} \\
x = 3 & VA & \text{(-)(-) \& (y)(-)} & \text{(+)(-)} \\
\end{array}
\]

\[
\begin{array}{c|c|c|c}
\text{\(f(0)\)} & \text{\(f(\infty)\)} & \text{\(f(\text{any})\)} & \text{\(f(0.01)\)} \\
\hline
\text{(-)(-)} & \text{(+)(-)} & \text{(+)(-)} & \text{(+)(-)} \\
\end{array}
\]

\[
\frac{f(-1)}{f(2.5)} = \frac{(-)(-)}{(+)(-)} = \frac{1}{3}
\]

\[
\frac{f(0)}{f(\infty)} = \frac{(-)(-)}{(+)(-)} = \frac{1}{3}
\]

\[
\frac{f(0.01)}{f(\text{any})} = \frac{(+)(-)}{(+)(-)} = \frac{1}{3}
\]