MTH 161, Quiz #8, Fall 2024 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round. Answer all parts of each question.

1. Solve the rational equation $\frac{x^2-4x+1}{x^3-x^2-2x} = 1$. Be sure to check for extraneous solutions.

$1-4(1)+1 = -2 \quad -2/-2 = 1$ ✓

$1-1-2 = -2$

$x^2-4x+1 = x^3-x^2-2x$

$x^3-2x^2+2x-1=0$

$0=(x-1)(x^2-x+1) \quad x = \frac{1 \pm \sqrt{1-4(1)}}{2}$ complex

$x=1$

$x-1 \overline{)\, x^3-2x^2+2x-1}$

x^2-x+1

$-x^3+x^2$

$-x^2+2x$

$+x^2-x$

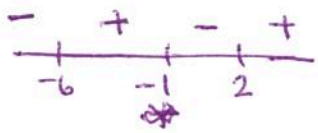
$x-1$

2. Solve the rational inequality $\frac{2x+17}{x+1} \geq x+5$. Write the solution in interval notation.

$\frac{2x+17}{x+1} - \frac{(x+5)(x+1)}{(x+1)} \geq 0 \qquad \frac{2x+17}{x+1} - \frac{x^2+6x+5}{x+1} \geq 0$

$\frac{-x^2-6x-5+2x+17}{x+1} \geq 0 \qquad \frac{-x^2-4x+12}{x+1} \geq 0 \qquad \frac{x^2+4x-12}{x+1} \leq 0$

$\frac{(x+6)(x-2)}{x+1} \leq 0$



$(-\infty, -6] \cup (-1, 2]$

3. Translate the following into a mathematical expression/statement: The drag of an object traveling through a fluid D varies jointly with the density of the fluid ρ and the square of the velocity of the object v.

$D = k\rho v^2$

4. According to the Centers for Disease Control and Prevention, a person's Body Mass Index B is directly proportional to his weight W in pounds and inversely proportional to the square of his height h in inches.
   a. Express this relationship as a mathematical equation.
   b. If a person who was 5 feet, 10 inches tall weighed 235 pounds had a Body Mass Index of 33.7, what is the value of the constant of proportionality?

$5'10'' = 70$

$B = kW/h^2$

$B = \frac{k(235)}{70^2} = 33.7 \qquad k\left(\frac{47}{980}\right) = 33.7$

$k \approx 702.68$

$k = 33026 \approx 702.68$