On all the following questions, show your work.

1. (10 points) Find the exact value of $|\sqrt{2} - 2| - |2 - 3\sqrt{2}|$. Leave your answer in radical form. No credit for a decimal answer.

2. (10 points) Find all values of $x$ such that $-3 \leq 2x - 3 \leq 6$.

3. (10 points) Find all roots of the equation 

   \[(x - 1)(x + 1) + (x - 2)(x + 1) = 0.\]

4. (10 points) Rationalize the numerator of the expression $\frac{\sqrt{1 + \pi - 2}}{h}$, and express your answer in simplified form.
5. (15 points) A. What is the distance between $(-3, 5)$ and $(6, 8)$?

B. The points $A = (0, 0), B = (8, 0),$ and $C = (x, y)$ are the vertices of an equilateral triangle (i.e., all the sides have the same length). Find $x$ and $y$. Write your answers in decimal form.

6. (10 points) What is the slope of the line joining the points $(-2, f(-2))$ and $(4, f(4))$, where $f$ is the function defined by

$$ f(x) = \begin{cases} x^2 - |x| & \text{if } x \leq 2 \\ 3x - 2 & \text{if } x > 2 \end{cases} $$

7. (10 points) The supply function for an item is given by $p = s(x) = 0.1x^2 - 12x + 700$ and the demand function is given by $p = d(x) = 0.1x^2 + 8x - 380$, where $p$ is measured in dollars and $x$ is the number of items. Find the equilibrium point. That is, find the number $x$ of items produced needed to equalize the supply and demand.
8. (40 points) Evaluate each of the limits, or state that it does not exist.

(a) \( \lim \limits_{x \to \infty} \frac{x^2 + 9x - 11}{2x^2 - 4x + 23} \)

(b) \( \lim \limits_{z \to 2} \frac{z^3 - 8}{z - 2} \)

(c) \( \lim \limits_{h \to 3} \frac{(2 - h)^2 + (2 + h)^2}{h^2 - 3h + 6} \)

(d) \( \lim \limits_{x \to 3} \frac{x - 3}{x^2 - 9} \)

(e) \( \lim \limits_{x \to 2} f(x) \)

where

\[
f(x) = \begin{cases} 
(x - 4)^2 & \text{if } x < 2 \\
7 & \text{if } x = 2 \\
5x - 6 & \text{if } x > 2 
\end{cases}
\]