On all the following questions, **show your work.**

1. (10 points) Find the <u>exact</u> 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 $\frac{\sqrt{4+h}-2}{h}$, 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) $\lim\limits_{x\to\infty} \dfrac{x^2 + 9x - 11}{2x^2 - 4x + 23}$

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

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

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

(e) $\lim\limits_{x\to 2} f(x)$
where
$$f(x) = \begin{cases} (x - 4)^2 & \text{if } x < 2 \\ 7 & \text{if } x = 2 \\ 5x - 6 & \text{if } x > 2 \end{cases}$$