SOLVE the following. Be sure to state restrictions and check for extraneous solutions.

1. $\dfrac{12 - 8x}{x^2 - 4} = \dfrac{3}{x + 2} - \dfrac{2x - 3}{x - 2}$	**2.** $\dfrac{1}{x} + \dfrac{x}{2} = \dfrac{x + 4}{2x}$

SIMPLIFY the following. State restrictions.
If you need more room, please do your factoring (diamonds and boxes) on a separate sheet of paper.

3. $\dfrac{\dfrac{x^4 - 15x^2 - 16}{3x^4 + x^2 - 2}}{\dfrac{5x^2 - 14x - 24}{6x^4 + 11x^2 - 10}}$

**4.** $\dfrac{\dfrac{81}{x^2} - 25}{\dfrac{9}{x} + 5}$

5. $\left(\dfrac{x + 1}{x - 1} + \dfrac{x + 2}{x - 2} - \dfrac{7x}{x^2 - 3x + 2} \right) \div \dfrac{2x^2 + 3x + 1}{x^2 - 1}$

6. Solve the following systems using substitution or elimination method.

a.
$$6x - 2y = 5$$
$$4x + 4y = 70$$

b.
$$2x^2 + 5y^2 = 53$$
$$3x^2 - 2y^2 = -6$$

The figure at right shows the design of a circular stained glass panel on display at Hopewell's Antique Shop. Seams separate the pieces of the panel. All red triangular pieces shown are congruent and have a common vertex with each adjoining triangular piece. The 2 squares shown are inscribed in the circle. The diameter of the panel is 2 feet.

seam

orange piece

red piece

yellow piece

2 feet
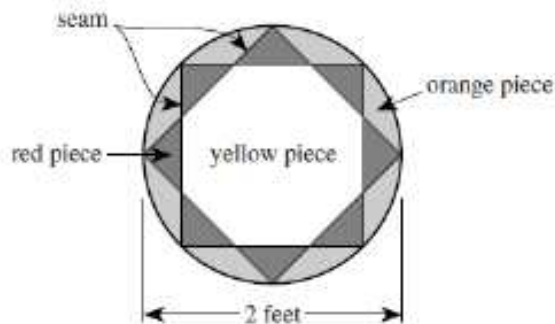
7. The design of the stained-glass panel has how many lines of symmetry in the plane of the panel?

| **A.** 2 | **B.** 4 | **C.** 8 | **D.** 16 | **E.** Infinitely many |

8. What is the area of the stained glass panel, to the nearest 0.1 square foot?

| **A.** 3.1 | **B.** 4.0 | **C.** 6.2 | **D.** 8.0 | **E.** 12.6 |

9. Kaya wants to install a new circular stained-glass window in her living room. The design of the window will be identical to that of the panel. The diameter of the new window will be 75% longer than the diameter of the panel. The new window will be how many feet in diameter?

| **A.** 1.50 | **B.** 2.50 | **C.** 2.75 | **D.** 3.50 | **E.** 4.00 |

10. For what value of a would the following system of equations have an infinite number of solutions?

$$2x - y = 8$$
$$6x - 3y = 4a$$

| **A.** 2 | **B.** 6 | **C.** 8 | **D.** 24 | **E.** 32 |

11. A 12 m flagpole casts a 9 m shadow. Find the angle of elevation (to the nearest tenth) of the sun.

12. A damsel is in distress and is being held captive in a tower. Her knight in shining armor is on the ground below with a ladder. When the knight stands 15 feet from the base of the tower and looks up at his precious damsel, the angle of elevation to her window is 60 degrees.
How long does the ladder have to be for him to reach her?

13. You are 200 yards from a river. Rather than walking directly to the river, you walk 400 yards along a straight path to the river's edge. Find the acute angle between path and the river's edge.

14. Suppose you're flying a kite, and it gets caught at the top of the tree. You've let out all 100 feet of string for the kite, and the angle that the string makes with the ground is 75 degrees. Instead of worrying about how to get your kite back, you wonder. "How tall is that tree?"
(Round to the nearest tenth of a foot.)

15. Given $\cos\theta = \dfrac{7}{25}$, draw and label a right triangle. Find the remaining 5 trig ratios.