1. The following are unrelated (no justification is needed for this problem): (8 pts)

   (a) Write in interval notation: $x \leq -\pi$ or $1 < x \leq \sqrt{3}$.

   (b) Write in interval notation: x is less than $\frac{2}{5}$ and greater than or equal to zero.

   (c) Graph on the real number line: $(-\infty, -3) \cup [3, \infty)$.

   (d) i. Plot the numbers -5 and -7 on the real number line.

   ii. Is the inequality $-5 < -7$ correct based on your answer to part i?

2. Perform the indicated operations (8 pts).

   (a) $\frac{4}{15} - \frac{3}{20}$

   (b) $\frac{3}{2}\left(1 + \frac{\frac{6}{5}}{3}\right)$

3. Consider the list of real numbers: $\left\{\frac{1}{4}, \pi, 0, -5, 97, \sqrt{3}\right\}$ (6 pts)

   (a) Write down the irrational numbers **note that some numbers may appear in more than one part**.

   (b) Write down the rational numbers **note that some numbers may appear in more than one part**.

   (c) Write down the integers **note that some numbers may appear in more than one part**.

4. Express the quantity without using absolute value: (4 pts)

   (a) $|7 - x|$ when $x < -7$

   (b) $|3 - \pi|$

5. The following are unrelated: (12 pts)

   (a) Add as indicated: $-2^2+8^0+3^{-1}$

   (b) Evaluate the expression: $\dfrac{2 - |4 - 11|}{|-1| - 5}$

   (c) Evaluate the expression: $\dfrac{\sqrt{32}}{\sqrt{18}}$

6. The following are unrelated: (8 pts)

(a) Simplify the expression: $(3x-5)^2+2x^5+3-\left(2x^2x^3\right)-x$.

(b) Combine into a single fraction:

$$\sqrt{4+x^2}-\frac{1}{\sqrt{4+x^2}}$$

7. Simplify the expression (give your answer without negative exponents) (4 pts): $3\left(a^{-1/2}\right)^{-12}+\dfrac{10a^8}{5a^2b^3b^{-3}}$

8. Is $x = 2$ a solution of $\left(x^2 + 14\right)(x-3)^9(x-1)^7\left(\frac{1}{3}\right) = -6$? As usual, make sure to justify your answer, an answer without work will receive no credit. (4 pts)

9. Consider the difference of two cubes formula, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ and the expression $8x^3 - 27y^3$. (7 pts)

   (a) In order to apply the formula to factor $8x^3 - 27y^3$ we need to identify what a and b are in the formula. Write down the appropriate values for a and b that allow us to factor $8x^3 - 27y^3$.

   (b) Now use the formula and your answer to part (a) to factor $8x^3 - 27y^3$.

10. Factor completely (If not factorable write NF): $2x^2y - 12xy^2 + 32xy$ (4 pts)

11. Factor each of the following completely (If not factorable write NF): (7 pts)

    (a) $x^{3/2} - 9x^{-1/2}$ (start by factoring out lowest power of x)

    (b) $x^2 + 16$

12. Simplify the complex fraction: $\dfrac{\frac{1}{x}-\frac{4}{x^3}}{1-\frac{1}{x-1}}$ (4 pts)

13. Divide: $\dfrac{\frac{x^3-x^2}{x^2+2x+1}}{\frac{38x-38}{4(x-1)}}$ (4 pts)

14. Solve each of the following equations: (8 pts)

(a) $x^2+10=7x$

(b) $\dfrac{x}{8}=\dfrac{3}{4}x-3-\dfrac{1}{4}$

15. Solve each of the following equations: (12 pts)

(a) $\sqrt{2} = (x+3)^2$

(b) Solve for r: $2r + 3pr = -5 + r$

(c) Solve: $4 - 2x = x^2$