

1. (14 points) Solve the following systems of linear equations. If the system is dependent or inconsistent, say so.

(a)

$$\begin{cases} 6x + y = 21 \\ 4x - y = 19 \end{cases}$$

(b)

$$\begin{cases} 2x - 3y = 6 \\ -6x + 9y = 2 \end{cases}$$

2. (12 points)

(a) Simplify the following

i.  $\frac{(3^2)^{-1}}{3^{-2}}$

ii.  $\frac{x^{-3}}{(x^{-2})^3}$

(b) Simplify the following expression so that no negative exponents appear in the final result and no variable appears more than once.

$$\frac{3(-2x^3y^{-1})^2(3x^{-2}y^3)^{-1}}{(2xy^2)^3(3y^{-2})^{-2}}$$

3. (10 points)

(a) Find the product  $(x + 1)(x^2 - x + 1)$

(b) Find the result with remainder of dividing  $2x^3 + x^2 - 5$  by  $x + 1$

4. (10 points) Given the polynomials:  $f(x) = x^5 + 2x^3 - 2x$  and  $g(x) = x^4 + 2x^3 + 4$ .

(a) Find  $g - f$

(b) What is the degree of  $f - g$ ?

5. (6 points) Tickets to a Linkin Park concert cost \$50 up front and \$25 otherwise. Knowing that the revenue from selling 1000 tickets was \$30000, how many tickets of each type were sold?

6. (8 points) Travelling for 3 hr into a steady headwind, a plane flies 1650 mi. The pilot determines that flying with the same wind (tailwind) for 2 hr, he could make a trip of 1300 mi. Find the speed of the plane and the speed of the wind.

7. (10 points) Which ones of the following are polynomials and which are not? Justify your answer:

(a)  $2^{-1}x^2y + 3xy$

(b)  $xy^{-1} + 2x^2y$

(c)  $3x^3 + 2x^2 + x$

(d)  $x^3y + \frac{2x}{y}$

(e)  $\frac{\pi}{3} + x^2$

8. (16 points) Factor each of the following completely.

(a)  $2x^2(x - 1) - x(x - 1)^2$

(b)  $x^2 - 2xy + y^2$

(c)  $3x^3y + 6x^2y + 3xy$

(d)  $6x^2 - x - 1$

9. (8 points) Solve each equation by factoring.

(a)  $2x^2 - x - 3 = 0$

(b)  $x^2 + 15 = 2x$

10. (6 points) One of the legs of a right triangle is 1 shorter than the other leg. Knowing that the hypotenuse has length 5, find the length of the legs.

11. EXTRA CREDIT (5 points) Solve the following system of linear equations:

$$\begin{cases} x + y + z - t = 3 \\ x + y - z + t = 7 \\ x - y + z + t = -1 \\ -x + y + z + t = 1 \end{cases}$$

