

Unit 1

1. Solve the following systems of equations

$$\begin{cases} 2x + y - 3z = -1 \\ 4x + 3y + z = \frac{4}{3} \\ 2x + 6y - z = -\frac{5}{6} \end{cases}$$

2.

(a) Let $f(x) = \frac{1}{2}|x+5| - 1$, find x-intercepts

and y-intercept algebraically.

(b) graph $f(x)$, verify your findings of intercepts from (a).

3.

(a) Graph $\begin{cases} x + y \leq 8 \\ 2x - 3y \leq 6 \end{cases}$ and

(b) find the coordinates of intersection of the boundary lines.

Unit 2

4. Given $g(x) = \frac{1}{3}x^2 - 2x - 1$,

$$h(x) = -\frac{1}{3}x - 4$$

(a) Use "Completing the square" to re-write $g(x)$ in the vertex form

(b) Solve $g(x) = h(x)$, if $x \in \mathbb{C}$.

(c) Graph $g(x)$ using the result from (a) and identify the following characteristics

(i) Opening

(ii) a.o.s

(iii) coordinates of the vertex

(iv) coordinates of the x-intercepts

(v) coordinates of the y-intercept

(d) Graph $h(x)$ on the same coordinate plane with $g(x)$. Explain and verify the solutions you found from question (b).

5. $z_1 = 1 + i$, $z_2 = -4i$

if $z_3 = z_1 + z_2$, $z_4 = z_1 z_2$ then

(a) rewrite z_3 , z_4 and $z_3 z_4$ in standard form

(b) Find $|z_3|$, $|z_4|$ and $|z_3 z_4|$

(c) Use result from (b) and verify $|z_3 z_4| = |z_3| |z_4|$

(d) Write a conjecture statement about the finding from (c).

(e) Prove algebraically that statement from (d) is always true as long as z_4 is not zero in length.

(Hint: Assume $z_3 = a_1 + b_1 i$ and $z_4 = a_2 + b_2 i$, then reason algebraically to show your conjecture from (d) is true).

Unit 3

6. Use GRASP Template to solve the world problem.

Train Table

There are 325 coins in Hannah's Piggy bank. After sorting the coins, Hannah found out only quarters, dimes and nickels are in the piggy bank. Samuel helps to count the coins, and found that just dimes and nickels together are \$17.60 and quarters are 12 dollars more than dimes. If Hannah wants to surprise her brother and uses her piggy bank savings to buy a train table for \$50.00 at Toys R Us, does she have enough? If she has enough, how much change will she get back? if the piggy bank saving is not enough, how much will she need in order to buy her brother the table? (Sales tax will be paid by her parents)

7. Factor the following expressions completely

a) $4x^2 - y^2 + 2x + y$

b) $a^4 - 3a^3b + 3ab^3 - b^4$

8. Use long Division to divide the two polynomials:

$$(x^6 - 3x^5 + 4x^3 - x^2 - 1) \div (x^2 - x)$$

9. Given $m(x) = 3x + 1$, $n(x) = x - 2x^2 + 1$

a) find $m(x) \cdot n(x)$

b) find $m(x) - n(x)$

Unit 4

10. If the degree of polynomial $f(x)$ is 4 and all coefficients of $f(x)$ are rational numbers. Find the remainder of $f(x) \div (x - 2)$ if the y-

intercept of $f(x)$ is (0, -13) and some of zeros

of $f(x)$ are $2 - 3i$, 4 and $-\frac{1}{2}$

11. Find all possible zeros (including the complex and irrational zeros) for

$$k(x) = x^4 + x^3 + x^2 - x - 2$$

12. if $p(x) = 2x^3 + ax^2 + bx + 1$ has a factor of $(x - 1)$ and the remainder of $p(x) \div (x - 2)$ is 11, find all zeros for $p(x)$.