INSTRUCTIONS: Put your last & first names on this sheet and on none of the other sheets. Do no more than 3 problems per page on the worksheets. Also put your answers on the worksheets. Box your answers. Draw a horizontal line segment between numbered problems on the same page. Number each problem on your worksheets. You must show work on each problem. You do not need to re-write the problem on your worksheet. Just put the problem number and do the work and write the answer (boxed). Each numbered problem counts 10 points. The Bonus counts 5 points.

1. Plot the polynomial function \( P(x) = (x-1)(x-2)^2 \) on your calculator (you don't have to show the graph on your answer sheet.) and give the \((x, y)\) coordinates of [a] all local maxima (round off your answers to 3 decimal places), and [b] all local minima (give exact x and y values), and [c] tell me your "window" values: Xmin =, Xmax =, Ymin =, Ymax =.

2. Use Long Division to divide \( P(x) \) by \( D(x) \), and express the quotient \( P(x)/D(x) \) in the form \( \frac{P(x)}{D(x)} = Q(x) + \frac{R(x)}{D(x)} \). In this problem \( P(x) = 6x^3 + x^2 - 12x + 5 \) and \( D(x) = 3x - 4 \).

3. Find the Quotient \( Q(x) \) and the Remainder \( R(x) \) using Synthetic Division:

\[
\frac{4x^2 - 3}{x + 5}.
\]

4. Find a polynomial \( P(x) \) in standard form of degree 4 with zeros \(-2, 1, 2, 3\).

5. Find all the real zeros of \( P(x) = x^4 + 2x^3 - 2x^2 - 3x + 2 \). Show work. Use the quadratic formula or completing the square, if necessary.

6. Use Descartes Rule of Signs to determine how many positive and how many negative real zeros the polynomial can have. Then determine the possible total number of real zeros. You must show some work to get any credit on this problem. \( P(x) = 2x^3 - x^2 + 4x - 7 \).

\[ P(x) = x^3 - 4x^2 + x + 6 \]

8. Evaluate the expression and write the answer in \( a + bi \) form.

[A] \( (−4 + i)−(2 − 5i) \) \quad [B] \( (6 + 5i)(2 − 3i) \)

9. [A] Evaluate the expression and express the result in \( a + bi \) form. \( \frac{2}{3 + i} - \frac{2}{3 - i} \)

[B] Evaluate the expression and express the result in \( a + bi \) form. \( i^{37} \)

[C] Evaluate the radical expression and express the result in \( a + bi \) form. \( \sqrt{−5} \sqrt{−10} \)

10. Find all solutions of the equation and express them in the form \( a + bi \). \( t - 2 + \frac{10}{i} = 0 \)

Bonus.

Find a polynomial \( P(x) \) of degree 3 with zeros \( \frac{1}{2}, 1, 2 \), and with 7 as the coefficient of \( x^2 \).