

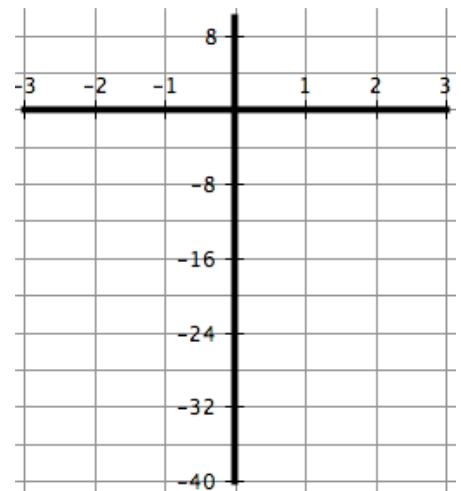
Calculator Active – You may use a graphing display calculator to answer the following questions.

1. The following questions all involve the polynomial $P(x) = -2x^3 - x^2 + 4x - 1$ **(10M)**
- Is $2x - 3$ a factor of the polynomial? How did you determine your answer?
 - Does the polynomial have an x-intercept at $x = 1$? How did you determine your answer?
 - If the polynomial is divided by $x + 3$, what is the remainder? How did you determine your answer?
 - If the polynomial is divided by $x + 3$, what is the quotient? How did you determine your answer?
 - Evaluate $P(4)$. How did you determine your answer?
 - True or false? In this polynomial, as $x \rightarrow \infty$, $y \rightarrow \infty$. How did you determine your answer?

2. You are now working with the polynomial equation $3x^3 + x = -6x^2 - 2$

(12M)

a. Graph the following two equations on your calculator as 2 separate equations where $y_1 = 3x^3 + x$ and then $y_2 = -6x^2 - 2$. Prepare a sketch of what you see, given the view window as $x_{\min} = -3$, $x_{\max} = 3$, $y_{\min} = -40$ and $y_{\max} = 10$



b. Briefly explain how you will use the graph to solve the given equation ($3x^3 + x = -6x^2 - 2$).

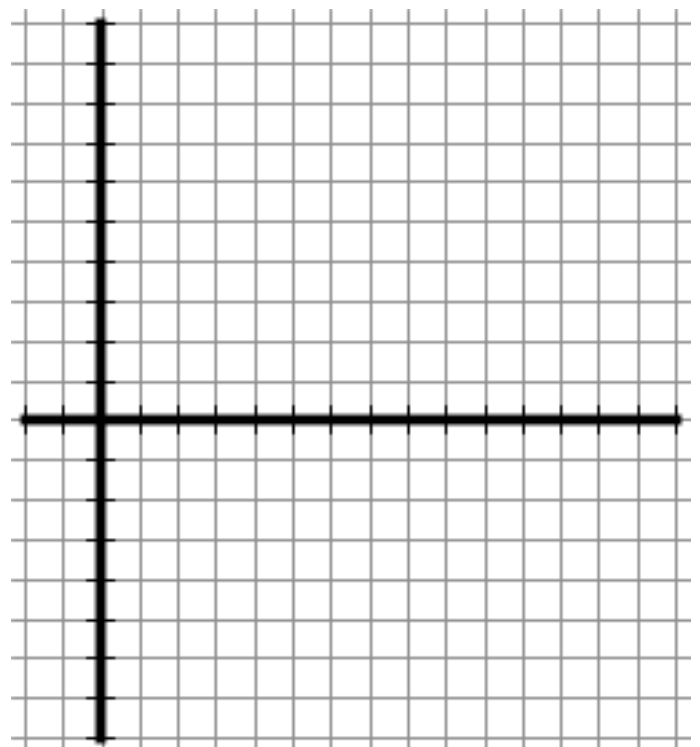
c. What is the solution to the equation ($3x^3 + x = -6x^2 - 2$)?

d. Solve the equation $3x^3 + 6x^2 + x + 2 = 0$ using the graphing calculator. How did you solve this equation? What do you notice about your solution? Explain why this is so.

e. Using the rearranged equation from question d, factor by grouping and then solve algebraically. Show all key algebraic steps in your solution.

3. My brother has a carpentry business and his profits from January 2006 to April 2007 are modeled by the polynomial equation $P(x) = -2.5x^4 + 77.5x^3 - 842.5x^2 + 3622.5x - 2455$. His profits are given in dollars and x refers the month of the year (using $x = 0$ to represent January). **(10M)**
- Determine his business's monthly profit in June. How did you get this value?
 - When did his business earn its maximum profit? What was his maximum profit?
 - My brother will hire an apprentice in months when his business earns at least \$2,000 per month. When does his business earn at least \$2,000 and for how long will an apprentice be employed?
 - When where the profits of his business decreasing?

- Include a sketch of the polynomial on the grid below. Label the axis and include an appropriate scale.



Calculator Inactive – You may not a graphing display calculator to answer the following questions.

1. List all possible rational roots of the polynomial equation $0 = 3x^3 - 30x^2 + 25x - 4$ **(2M)**

2. Use synthetic division to divide $x^3 + x^2 + x - 14$ by $x + 2$. State the quotient and the remainder of the division. **(3M)**

3. Determine the x-intercepts of the polynomial $P(x) = (x + 4)(2x - 1)(x + 5)(x - 2)$. Explain how you determined these values. **(2M)**

4. Determine the remainder when the polynomial $P(x) = x^3 - x^2 + 2x + 3$ is divided by $x - 2$. So then, is $x - 2$ a factor of the polynomial? Why or why not? **(3M)**

5. Evaluate $P(2)$ when $P(x) = x^4 - 2x^3 - x + 2$. Based upon your value of $P(2)$, what conclusion can you make about the polynomial? **(2M)**
6. Factor the expression $8x^3 - 27$. Show complete work. **(3M)**
7. Write a polynomial function in standard form given that its x-intercepts are 1, -1, and 2 **(2M)**
8. Included here is a table of values from a polynomial. Determine where the x-intercept(s) of the polynomial are. Explain your reasoning. **(3M)**

x	-4	-3	-2	-1	0	1	2	3
y	-35	-4	9	10	5	0	1	14

9. Solve the equation $x^3 - 10x = -8 - x^2$ using an appropriate algebraic method.

(5M)

10. Factor $x^4 - 13x^2 + 36$ fully using the most effective factoring method.

(4M)

11. You are given a graph of the polynomial function below. Use the graph to estimate the following:

- a. What are the maximum and minimum points of the polynomial? (2M)

- b. Describe in words where the polynomial is increasing? (2M)

- c. Where are the roots of the polynomial? (1M)

- d. What are the linear factors of the polynomial? (1M)

- e. Predict the remainder when the polynomial is divided by $x + 1$. Explain how you determined your reasoning. (2M)

f. Determine where the polynomial has function values greater than $y = 4$. Explain your reasoning (2M)

