

This assignment is due on **October 1, 2012**.

Goals:

- 1) To practice the art of communicating a written solution to a math problem. You must clearly present the key concepts and the logical sequence of steps taken to arrive at a solution. Just answers are not good enough! Illustrations of solutions by graphing or drawing diagrams are often part of your presentation.
- 2) To encourage the use of the math textbook as a resource for you to learn from and get explanations of concepts and sample solutions.
- 3) To encourage a dialog between students of concepts and processes to achieve solutions to mathematical problems.

Format requirements:

This assignment will be graded so you must show at least one (most of these questions require many more than one) step of work for each question. If I cannot see clearly what you have done I cannot give you the marks. There is only one accepted format for this and all future assignments.

- 1) You will choose 3 of the 5 given questions to complete. (It is still to your advantage, however, to know how all of them are done.) All questions are worth the same number of marks. The questions must be in the same order that they are presented to you. If you do more than 3 questions, only the first 3 will be marked.
- 2) Each step
for each question
must be
on the next line
down, not to the right.
- 3) Students are encouraged to help each other with understanding the assignments but must submit their own work.
- 4) Any explanations must be done in complete sentences with proper mathematical notation as necessary.

Copied assignments will not be marked.

Questions:

1. Prove that if the function $P(x) = 2x^3 - 9x^2 + 13x + k$ is divisible by $x - 2$, then it is also divisible by $x - 1$. Also determine any other binomial factors it may have.
2. Let $A(x) = 4x^3 - 9x^2 - 12x + 3$ and $B(x) = 12x^2 - 18x - 12$.
 - a) Algebraically determine the x -coordinates of the zeroes of $B(x)$.
 - b) With what points on $A(x)$ do the values from part a) correspond?
 - c) Examine the equations of the original two functions very carefully. Explain how one can derive $B(x)$ from $A(x)$. Then, given the following $A(x)$ functions, derive their corresponding $B(x)$ functions:
 - i) $A(x) = 2x^4 + x^3 - 7x^2 + 5x - 3$
 - ii) $A(x) = x^5 - 3x^4 + 9x^2 - 1$
3.
 - a) Simplify the function $f(x) = \sqrt{x^4}$.
 - b) On the same grid, sketch the graphs of the function $f(x) = x(x-1)(x+4)(x+1)$ and $r(x) = \sqrt{x(x-1)(x+4)(x+1)}$.
 - c) Determine a value k such that the quadratic function $g(x) = (x+k)^2$ approximates $r(x)$ from part b) as $x \rightarrow \infty$ and $x \rightarrow -\infty$.
 - d) Let $m(x) = \sqrt{(x+a)(x+b)(x+c)(x+d)}$. Determine a value k such that the quadratic function $q(x) = (x+k)^2$ approximates $m(x)$ as $x \rightarrow \infty$ and $x \rightarrow -\infty$.
4. Given the function $f(x) = \frac{x^2 - 16}{\sqrt{x} - 2}$:
 - a) Sketch the graph of $f(x)$. Show a table of values.
 - b) State the domain and range of $f(x)$.
 - c) Show *from the equation* of $f(x)$ whether any non-permissible values of x are vertical asymptotes or holes.
5. Harry and Sally design a T-shirt to promote their monkey day care business. It is a popular design, so they start up with a used printing machine (purchased for \$400), and they estimate that it will cost them \$5.00 to print each T-shirt.
 - a) Write a linear function $C(x)$ to represent the total cost of producing x T-shirts, including start-up costs.
 - b) Write a rational function $A(x)$ to represent the average cost per shirt when x T-shirts are produced.
 - c) Determine $A(5)$ and $A(50)$. Explain why these average costs would be so dramatically different.
 - d) What is the domain of $A(x)$ in the context of this question? Assume that they will not purchase the printing machine without producing any shirts.
 - e) State the horizontal asymptote of $A(x)$. Explain its significance in the context of this question.