Calculus AB   Cubic Polynomial Mini-Project   Name_____
Chapter 2   Date_____Per____

I. Your Birthday Polynomial

Construct your birthday polynomial as follows: $B(x) = x^3 -$ (month) $x^2 +$ (day) $x -$ (year)

For example, if your birthdate is March 31, 1985, then $B(x) = x^3 - 3x^2 + 31x - 85$.

My birthday polynomial is B(x) = _____

A. General info
Enter B(x) into y_1. Find a window that gives a good view of B(x), including its roots and
y-intercept. <u>Attach</u> that graph, and the window used.

List the Real roots_____   List the y-intercept_____
Domain _____   Range_____
What is the domain and range of <u>any</u> cubic polynomial? _____

Find B(2) = _____   Is B(x) increasing or decreasing at x = 2? _____

B. A trick
Pick one root (Note: You may have only one Real root.) Call it R. R = _____
Do <u>not</u> round off R when you find the root and store it in R.

Divide $\dfrac{B(x)}{(x-R)}$. Note: You'll need to use the PropFrac command from the Algebra menu.
Write the Quotient here. Q (x) = _____
Note: There should be no remainder. (Or almost no remainder….remember not to round off the
Root, and it should come out without a remainder.)

Graph the quadratic polynomial Q(x). Find its vertex (its minimum point). Call that point (H, K).
Store the values of H and K, again without rounding them off.
H = _____   K = _____

Now find the following. <u>Do</u> round off these answers to 3 decimal places.
2 H + R = _____
H^2 + K + 2 R*H = _____ (Note: You must put in the multiply sign)
R*(H^2 + K) = _____

What do you notice?

II. A new birthday polynomial:

Construct $P(x) = \frac{1}{12} \times (x - month)(x - day)$

For example, if your birthday is March 31st, then $P(x) = (1/12) \times (x - 3)(x - 31)$.

My birthday polynomial is P(x) = _____

A. General Info
Enter P(x) into y$_1$. Find a window that gives a good view of B(x), including its roots and
y-intercept. <u>Attach</u> that graph, and the window used.

List the Real roots_____   List the y-intercept_____

Relative maximum_____   Relative minimum_____

What is the effect of "a"? _____

B. Expand P(x) so that it is in the form y = ax^3 + bx^2 + cx + d.
P(x) = _____
a = _____   b = _____   c = _____   d = _____

Compute the point $\left(\frac{-b}{3a}, P\left(\frac{-b}{3a}\right)\right)$ List it here: _____

Locate that point on your attachment, using a colored pen or pencil. What do you notice about
this point?

C. Graph P(x) and its derivative in the same window. <u>Attach</u> that graph. Suggestion: Make P ' a
"thick" graph.
State P '(x) = _____
State P "(x) = _____

Look at the first interval where P(x) is increasing. Note: This interval should go from -∞ to the
x-coordinate of the relative maximum. What is the sign of P '(x) in that interval? _____

On what interval is P(x) decreasing? _____
What is the sign of P '(x) in that interval? _____

D. Find the average of any two of the roots. Call it M. Locate the point (M, P(M)) on your
graph. Draw the tangent line at x = M. What do you notice? If you don't notice anything,
average another two roots, and repeat the process.