Name_____ Period_____ Date_____

NON-CALCULATOR SECTION

Vocabulary: Define each word and give an example.

1. Repeated Zero

2. Polynomial Function

3. Zero Product Property

Short Answer:

4. Describe how to find the possible rational zeros of a polynomial function.

5. What does the Fundamental Theorem of Algebra state?

Review:

6. Linear regression was performed on a set of ordered pairs. The correlation coefficient was found to be -0.65. Interpret this value.

7. Simplify $(3-2i)(-2+5i)$.

8. Use the quadratic formula to solve $x^2+5x-3=0$

9. Find the inverse of $f(x)$ if $f(x)=2x-3$.

Problems:
Be sure to show all work used to obtain your answer. **Circle or box in the final answer.**

10. Use the rational zeros test to list ALL the possible candidates for rational zeros of the polynomial.
$f(x) = 4x^3 + 3x^2 - 5x - 6$

11. Solve the equation:

a. $\left(2x^2 + 3\right)^2 = 4x\left(x^3 + 6\right)$ b. $4y^3 + 48y^2 = 4y^4$ c. $3x^3 - 6x^2 = 4x - 8$

12. List the possible rational zeros of the function. Then, find ALL of the zeros of the function.
$f\left(x\right) = x^3 + 2x^2 - 5x - 6$

13. Using the given zero, find ALL of the zeros and write a linear factorization of $f(x)$.

$1+i$ is a zero of $f(x) = x^4 - 2x^3 - x^2 + 6x - 6$

14. Is it possible to find a polynomial of degree 4 with real number coefficients that has -2 as its only real zero? Answer yes or no and explain.

15. Write a polynomial function of least degree that has real coefficients, the given zeros, and a leading coefficient of 1. Zeros: $3, -3, 2i, -2i$

MULTIPLE CHOICE QUESTIONS

16. Which of the following represents the solution set of the polynomial equation $f(x) = 4x^3 - 8x^2 - x + 2$?

A. $\left\{-\frac{1}{2}, \frac{1}{2}, 2\right\}$

B. $\left\{-1, \frac{1}{2}, 2\right\}$

C. $\{0, 1, 2\}$

D. $\left\{-2, \frac{1}{2}, 2\right\}$

17. According to the Fundamental Theorem of Algebra, how many complex zeros does the polynomial $f(x) = -4x^3 + 5x^2 + 7x - 2$ have?

A. 2 B. 3 C. 4 D. 5

18. The volume of a rectangular prism is 225 cubic centimeters. The base of the prism is a square and the height of the prism is 4 centimeters greater than a side length of the base. What is the height of the prism? $\left(V = \frac{Bh}{3}\right)$

A. 4 cm B. 5 cm C. 9 cm D. 25 cm

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CALCULATOR SECTION

1. Find the unique polynomial with real coefficients that meet these conditions.

   Degree 3; zeros at $x = 2 - i$ and $x = -1$; $f(2) = 6$

2. Consider the collection of all rectangles that have lengths 1 inch less than three times their widths. Find the possible widths (in inches) of these rectangles if their perimeters are less than 270 inches.

3. Find all of the zeros of the function $f(x) = x^4 + x^3 - 11x^2 - 5x + 30$. You can use your calculator to find the real zeros and then use synthetic division to find the others. No decimal answers.

4. Show that the *n*th order finite difference for the function $f(x) = x^3 + 2x^2 - x - 2$ of degree *n* is finite and constant by finding six consecutive values beginning with $f(0)$ and finding the finite differences until they are a non-zero constant.

5. Using your graphing calculator, find a polynomial model that fits the data below.

x	1	2	3	4	5	6
f(x)	-1	5	33	95	203	369

6. Find a cubic function containing the following points: (-2, 0), (1, 0), (3, 0) and (-1,16).

7. The data in the table give the average speed *y* (in knots) of the *Trident* motor yacht for several different engine speeds *x* (in hundreds of revolutions per minute, or RPMs).

Engine speed, x	9	11	13	15	17	19	21.5
Boat speed, y	6.43	7.61	8.82	9.86	10.88	12.36	15.24

a. Find a polynomial model for the data.

b. Estimate the average speed of the *Trident* for an engine speed of 1600 RPMs.

8. Using finite differences, determine the degree of the polynomial represented by the table below.

1	2	3	4	5	6
-1	3	3	5	15	39

9. Write the polynomial as a product of factors that are irreducible over the reals. Then, write the polynomial in completely factored form. $f(x) = x^4 - 2x^3 + x^2 - 8x - 12$