F.S.T. **Name _____**

Chapter 9 Review **Block _____ Date _____**

Non-Calculator

1. Given $p(x) = 3x^7 + x^5 - 2x^3 + 6x^2 - 127$, find each:

a) n **b)** a_n **c)** a_4 **d)** a_0

2. Use the graph at the right to find each of the following.

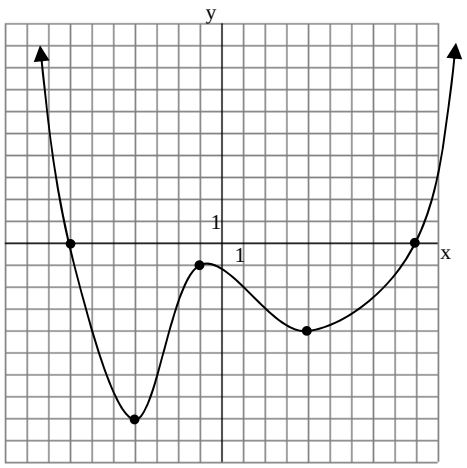
a) All extrema

b) All relative extremum

c) Zeros

d) Intervals on which the function is increasing and decreasing

e) Intervals on which the function is positive and negative



3. *Multiple Choice.* A polynomial $q(x)$ is divided by $x+3$ and the remainder is 7. Which of the following points must lie on the graph of $q(x)$?

A. (7, -3) B. (3, 7) C. (3, 0) D. (-3, 7) E. None

4. Determine the remainder when $y^6 - 8y^4 - 80$ is divided by $y-2$ (without using long division).

5. Divide $x^6 + 5x^3 - 2x$ by $x-2$ using long division.
List the quotient and the remainder.

6. If $2x+9$ is a factor of $f(x)$, what is a zero?

7. Find an equation for a polynomial function with zeros $x = 6, \frac{-1}{4}, and\ 10$ if the degree is unknown.

8. Find all solutions of $y = x^3 + 16x^2 - 23x - 102$ if $(x - 3)$ is a factor. Then, write the equation of the polynomial in factored form.

9. *True or False*. If $7 - 8i$ is a zero of a polynomial of degree $n \geq 1$, then $-7 + 8i$ is also a zero.

For 10-15, factor completely. (There may or may not be this many factoring questions on the test.)

10. $x^2 + 49$

11. $x^2 - 9x + 20$

12. $2x^2 + 7x + 6$

13. $18x^2 - 60x + 50$

14. $3x^4 + 21x^2 - 5x - 35$

15. $2x^3 + 5x^2 - 18x - 45$

Calculator Allowed

16. Suppose a piece of cardboard 90 cm by 75 cm is used to make an open top box by cutting out squares that are x cm by x cm from the corners.

a) Draw and label a picture of this situation.

b) Express the volume as a polynomial in terms of x.

c) State the interval of x for which the function is defined

d) State the degree.

17. To save money for a car, Jim deposits most of his summer job earnings in a savings account at the end of each summer. He deposits $2,000 in the first year and, in each of the next three years, deposits $250 more than he did in the preceding year. Assume that he makes each deposit on the same day of the year, that the annual interest rate is x and remains constant, and that he makes no other transactions.

a) Find a polynomial in x that expresses Jim's total accumulated savings immediately after he makes his last deposit.

b) Evaluate the expression in part **a** when the interest rate is 3.4%.

18. Consider a function *g* described by the data points below.

n	-2	-1	0	1	2	3
g(n)	-47	-8	1	4	25	88

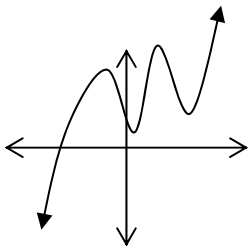
Find the degree and the formula for *g(n)*. SHOW WORK!!

19. Let $z = 3 + 2i$ and $w = 5 - 4i$. Express each of the following in $a + bi$ form.

a) $z - w$ **b)** $3z + 2w$ **c)** wz

20. Express $\dfrac{6 - 2i}{3 + 4i}$ in $a + bi$ form.

21. Part of the graph of a polynomial function p is shown at the right.



a) What is the smallest number of real zeros the graph of p can have?

b) What is the lowest degree that p can have?

For 22-24, find all zeros. Show verification for all zeros.

22. $y = x^2 - 2x + 12$ 23. $y = x^3 + 3x^2 - 23x + 35$ 24. $y = x^5 - 4x^4 + x^3 + 10x^2 - 4x - 8$

25. Consider the polynomial function with $g(x) = (x - 8)^3(2x - 3)^2(5x + 1)$.

a) Which zero has a multiplicity 2?

b) List all of the zeros of this function with their multiplicities.

c) How many x-intercepts (not zeros) does the graph of $g(x)$ have?

d) What is the degree of $g(x)$?

26. Explain why a polynomial function of degree seven must have at least one real zero.

Answers:

1a) 7 b) 3 c) 0 d) –127

2a) maximum: N/A minimum: -8
b) relative max: -1 relative mins: -8, -4
c) –7 and 9
d) increasing: $-4 < x < -1$ and $x > 4$
decreasing: $x < -4$ and $-1 < x < 4$
e) positive: $x < -7$ and $x > 9$
negative: $-7 < x < 9$

3) D 4) –144

5) Quotient: $x^5 + 2x^4 + 4x^3 + 13x^2 + 26x + 50$
Remainder: 100

6) $x = \frac{-9}{2}$

7) $f(x) = k(x-6)(x+\frac{1}{4})(x-10)$

8) Zeros: x= 3, -2, -17
Equation: $y = (x-3)(x+2)(x+17)$

9) False

10) $(x+7i)(x-7i)$

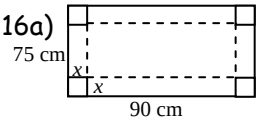
11) $(x-4)(x-5)$

12) $(2x+3)(x+2)$

13) $2(3x-5)^2$

14) $(3x^3-5)(x+7)$

15) $(2x+5)(x+3)(x-3)$

16a) 

b) $V = 4x^3 - 330x^2 + 6750x$
c) $0 < x < 37.5$ d) 3

17a) $2000x^3 + 2250x^2 + 2500x + 2750$
b) $ 9951.61

18) Degree: 3 Equation: $y = 4x^3 - 3x^2 + 2x + 1$

19) a) $-2+6i$ b) $19-2i$ c) $23-2i$

20) $\frac{2}{5} - \frac{6}{5}i$

21a) 1 b) 5

22) $x = 1 \pm i\sqrt{11}$

23) $x = -7, 2 \pm i$

24) $x = -1$ (multiplicity 2)
$x = 2$ (multiplicity 3)

25a) $x = \frac{3}{2}$
b) $x = \frac{3}{2}$ (multiplicity 2)
$x = \frac{-1}{5}$ (multiplicity 1)
$x = 8$ (multiplicity 3)
c) 3 x-intercepts
d) 6

26) Since this polynomial has an odd degree, then one end of the polynomial's graph goes up and the other end goes down. Therefore, the graph must cross the x-axis at least once.