Name KEY __________ Date __________ Period ______

PreAP Precalculus

TEST Chapter 3.1, 3.2, and 3.4 Form A. No Calculator Permitted

Part I: Multiple Choice

A calculator will be permitted for this section. Put your CAPITAL LETTER answer choice in the blank to the left of the number.

E 1. Let *R, S, T,* and *V* be the roots of $f(x)=2x^4-17x^3+6x^2+17x-8$. If $f(1)=0=f(8)$, find the product *RSTV*.

$2x^2+x-1=0$ $(2x-1)(x+1)$ $x=1, 8, \frac{1}{2}, -1$

(A) 24 (B) −8 (C) 8 (D) 4 (E) −4

D 2. Simplify: $i^{487}=$

$4\overline{)487}$ 121

(A) i (B) −1 (C) 1 (D) $-i$ (E) 0

E 3. Which of the following MUST be true about a polynomial function of even degree?

(A) It is an even function (B) It has no real solutions (C) It has an odd number of complex roots (D) It has at least one irrational root (E) It has an odd number of relative extrema

A 4. If $x+1$ is a factor of $f(x)=x^3-x^2-10x-8$, which of the following is another factor of $f(x)$?

(A) $x+2$ (B) $x+3$ (C) $x-2$ (D) $x-3$ (E) $x-1$

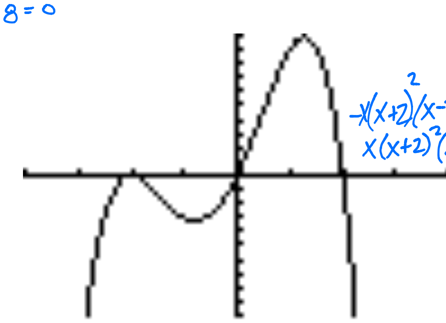
$x^2-2x-8=0$ $(x-4)(x+2)$

B 5. The value of *k* that will make $x+1$ a factor of $kx^3-17x^2-4kx+8$ is:

(A) −3 (B) 3 (C) −5 (D) 4 (E) −1

$-k-17+4k+8=0$ $3k=9$

C 6. Which of the following equations could be the equation of the graph at right?



$-x(x+2)^2(x-2)$ $x(x+2)^2(2-x)$

(A) $f(x)=x(x+2)^2(x-2)$ (B) $f(x)=-x^2(x+2)(2-x)$

(C) $f(x)=x(x+2)^2(2-x)$ (D) $f(x)=x(x+2)(x-2)^2$

(E) $f(x)=-x(x+2)(x-2)^2$

B 7. If a function of degree 6 has roots of -1, 2, $\sqrt{2}+1$ and $i+1$, another root MUST be which of the following?

(A) $\sqrt{2}-1$ (B) $1-\sqrt{2}$ (C) $i-1$ (D) -2 (E) $-i-1$

A 8. What is the remainder when $f(x)=2(x-1)^3+9$ is divided by *x*?

(A) 7 (B) 5 (C) 3 (D) 2 (E) 1

D 9. An equation of a polynomial of the form $y=Af(x)$ of lowest degree with the following characteristics $f(0)=-5$, $f(1)=0$, $f(i)=0$, and $f(\sqrt{2})=0$ has a vertical dilation value of $A=$

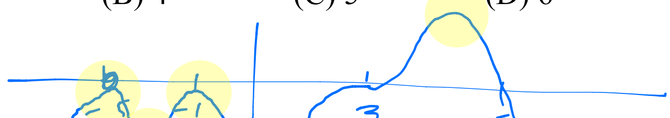
(A) -1 (B) $\frac{2}{3}$ (C) 3 (D) $-\frac{5}{2}$ (E) $-\frac{4}{3}$

$A(x-1)(x-i)(x+i)(x-\sqrt{2})(x+\sqrt{2})$

$-5=A(-1)(-i)(i)(-\sqrt{2})(\sqrt{2})$; $-5=A(-1)(-2)$, $A=\frac{-5}{2}$

C 10. An equation of an 8th degree polynomial with a negative leading coefficient whose only roots are $x=-5$ $(m2)$, $x=-1$ $(m2)$, $x=3$ $(m3)$ and $x=5$ $(m1)$ has how many relative extrema?

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7



Part II: Free Response

Show all work and proper notation in the space provided below or to the right of each problem. Be sure to label your work corresponding to each part (a), (b), (c), etc.

1 E
2 D
3 E
4 A
5 B
6 C
7 B
8 A
9 D
10 C

11. For $h(x) = -23x^4 - 34x^2 - 4x^5 - 7 + 4x^6 + 24x^3 + 28x$

(a) Write $h(x)$ in standard form.

(b) $\lim\limits_{x \to -\infty} h(x) =$

(c) What is the coordinate, (x, y), of the y-intercept of $h(x)$?

(d) List ALL the distinct, possible rational roots.

(e) Given that $h(i) = 0$ and $x = \frac{1}{2}$ is a multiplicity 2 root (m2) of $h(x)$, use (and show) synthetic division to find all the exact values of the other complex roots guaranteed by the Fundamental Theorem of Algebra. **List** all you final roots at the ends as $x =$

(a) $h(x) = 4x^6 - 4x^5 - 23x^4 + 24x^3 - 34x^2 + 28x - 7$ ✓1

(b) $\lim\limits_{x \to -\infty} h(x) = \infty$ ✓2

(c) $(0, -7)$ ✓3

(d) -7: $\pm 1, \pm 7$

4: $\pm 1, \pm 2, \pm 4$

List: $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm 7, \pm \frac{7}{2}, \pm \frac{7}{4}$

(e)

	4	−4	−23	24	−34	28	−7
$\frac{1}{2}$	↓	2	−1	−12	6	−14	7
	4	−2	−24	12	−28	14	0
$\frac{1}{2}$	↓	2	0	−12	0	−14	
	4	0	−24	0	−28	0	
i	↓	$4i$	−4	$-28i$	28		
	4	$4i$	−28	$-28i$	0		
$-i$	↓	$-4i$	0	$28i$			
	4	0	−28	0			

$4x^2 - 28 = 0$

$x^2 = 7$

$x = \pm\sqrt{7}$

$\boxed{\text{Roots: } x = \frac{1}{2}(m2), \pm i, \pm\sqrt{7}}$