MU ALPHA THETA CONVENTION 1991

POLYNOMIALS TOPIC TEST

1. $(x+3)$ is a factor of $cx^3+(16+c)x^2+(3c+2)x-3$ if and only if c=

   A. -4 B. $-\frac{11}{3}$ C. $\frac{11}{3}$ D. 4 E. 5

2. Give the remainder when $(x^{203}-1)$ is divided by x^4-1.

   A. x^3-1 B. x^3-x+1 C. x^3+1 D. $x-1$ E. none of these

3. The equation $x^4-16x^3+94x^2+px+q=0$ has two double roots. Find p+q.

   A. -15 B. -20 C. -24 D. -25 E. none of these

4. The equation with roots $3+\sqrt{2}$, $3-\sqrt{2}$, $-3+i\sqrt{2}$, and $-3-i\sqrt{2}$ is in the form $x^4+Ax^3+Bx^2+Cx+d=0$. Find A+B+C+D.

   A. 50 B. 24 C. 20 D. 35 E. none of these

5. For what value(s) of b will the zeros of $x^2+bx+15$ have a difference of two?

   A. 13 B. ±8 C. ±4 D. 9 E. none of these

6. Find all x satisfying $(x^2-4x+3)^2-2(x^2-4x+3)=-1$.

   A. $2\pm\sqrt{2}$ B. $3\pm\sqrt{2}$ C. $1\pm\sqrt{2}$ D. $\pm\sqrt{2}$ E. none of these

7. The equation $x^3+6x^2+11x+6=0$ has

   A. no negative roots B. no positive roots
   C. no real roots D. 1 positive and 2 negative roots
   E. 1 negative and 2 positve roots

8. Transform the equation $x^3-x^2-x-1=0$ so that each of its roots will be decreased by $\frac{1}{3}$. If the resulting equation is in the form $Ax^3+Bx^2+Cx+D=0$, where A, B, C, and D are relatively prime integers with A>0, find A+B+C+D.

A. -6 B. 29 C. -47 D. 38 E. none of these

9. $\frac{x^3-0.1x^2+1.2x+0.05}{x-0.7}=Ax^2+Bx+C+\frac{R}{x-0.7}$. Find A+B+C+R.

A. 3.804 B. 4.404 C. 4.234 D. 4.454
E. none of these

10. The roots of $3x^3-14x^2+x+62=0$ are a, b, and c. Find the value of $\frac{1}{a+3}+\frac{1}{b+3}+\frac{1}{c+3}$.

A. $-\frac{13}{20}$ B. $-\frac{63}{74}$ C. $\frac{83}{74}$ D. $\frac{41}{148}$ E. none of these

11. How many possibilities are there when testing for the rational roots of $6x^3-7x^2+11x+35=0$?

A. 4 B. 8 C. 12 D. 32 E. none of these

12. The smallest root of the equation $3x^3+11x^2+12x+4=0$ is

A. -1 B. $-\frac{2}{3}$ C. $-\frac{1}{2}$ D. $\frac{1}{2}$ E. -2

13. If $x^3+cx+d=0$ has a pair of equal roots, find $4c^3+27d^2$.

A. -5 B. 0 C. 23 D. 31 E. none of these

14. When a polynomial "f" is divided by $(x^2-4)(x+1)$, the remainder is x^2+3x+5. What is the remainder when f is divided by x^2-4?

A. x+3 B. x-3 C. 3x+9 D. 3x-9 E. none of these

15. Describe the roots of $f(x)=x^5-x^4+x^3+8x^2+2x-2$.

A. 2 positive real, 1 negative real, and 2 complex roots
B. 1 positive real, 2 negative real, and 2 complex roots
C. 1 positive real and 4 complex roots
D. 1 negative real and 4 complex roots
E. none of these

16. If a and b are rational and $1-\sqrt{5}$ is a root of $2x^3+ax^2+bx-4=0$, find a+b.

A. -13 B. -7 C. 7 D. 13 E. none of these

17. Transform the equation $2x^4-9x^3+8x+7=0$ to decrease each of its roots by 4.

A. $2y^4+23y^3+84y^2+88y-25=0$
B. $2y^4-13y^3-4y^2+4y+3=0$
C. $3y^4+13y^3+13y^2+12y+11=0$
D. $2y^4+21y^3+64y^2+76y-28=0$
E. $2y^4-23y^3-64y^2+18y-13=0$

18. If $3+\sqrt{a}$ is a root of $2x^3-8x^2-12x+b=0$ and a and b are rational but $\sqrt{a}$ is not, find a+b.

A. -21 B. 17 C. 21 D. 27 E. none of these

19. What is the remainder when $x^{100}-2x^{99}+4$ is divided by x^2-3x+2?

A. x-1 B. x+2 C. x+1 D. x-2 E. none of these

20. The sum of the roots is 3 and the product is 6 in the equation: $ax^3-6x^2+2ax-3b=0$. Find the sum of a and b.

A. 4 B. 6 C. 8 D. 10 E. none of these

21. Find the sum of the irrational roots of $6x^4+49x^3+38x^2+5x=0$

A. $-\frac{49}{6}$ B. -8 C. $2\sqrt{11}$ D. 8 E. none of these

22. If a, b, and c are the roots of $2x^3-7x^2+8x-5=0$, evaluate $a^2+b^2+c^2$.

A. $\frac{17}{4}$ B. $\frac{21}{4}$ C. $\frac{25}{4}$ D. $\frac{29}{4}$ E. none of these

23. Find the remainder when $2x^5-3ix^4+(1+i)x^2-(3+2i)x+1$ is divided by x-1+i.

A. -10+19i B. 10-19i C. -10-19i D. 10+19i
E. none of these

24. Find a polynomial f(x) of degree three such that f(10)=300 and the roots of f(x) are 0, 5, and 8.

A. $f(x)=x^3-8x^2+10x$ B. $f(x)=3x^3-39x^2+120x$
C. $f(x)=x^3-13x^2+40x$ D. $f(x)=x^3-13x^2+40x+200$
E. none of these

25. Two roots of $3x^3-17x^2+ax+b=0$ are 2 and 4. If the third root is c, find abc.

A. -48 B. -24 C. -8 D. 18 E. 36