Algebra II Individual Test Solutions
Miami Sunset Invitational - January 26, 2002

1. D Do synthetic division with -2 leaving zeros for the x^3 and x terms. Remainder is 41.

2. B Multiply the equation through by x^2-4 to eliminate denominators.
$7x(x+2)+2x(x-2)=9x^2-36$
Solving this equation gives $x=-\frac{18}{5}$.

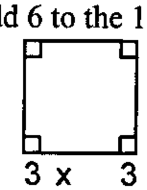
3. A $(-1+i\sqrt{3})^2=-2-2i\sqrt{3}$;
$(-2-2i\sqrt{3})(-1+i\sqrt{3})=8$

4. A $(x+y)^2+(y-x)^2=2x^2$,
$x^2+2xy+y^2-2xy+x^2=2x^2$,
$2y^2=0, y=0$

5. B $i^{47}=-i, i^{20}=1$;
$6i^{47}=-6i, 4i^{20}=4$
$4-6i$

6. A

7. B Let x represent the length of the side of the box. $V=lwh$,
$363=x\bullet x\bullet 3, x=11$;
Add 6 to the 11, 17 inches.



8. D $x^4+3x^2=7x^2$, solving this gives $x=0,2,-2$.

9. D $3x-5=2\sqrt{x}$, square both sides,
$=9x^2-30x+25=4x$. Solve and get $x=1,\frac{25}{9}$, reject the 1.

10. E Find the discriminant of each.
A $16-8=8$, B $36-36=0$,
C $25-8=17$, D $4+28=32$
Since we want the discriminant to be less than zero, E is the correct answer.

11. C $\frac{a}{b}=\frac{5}{9},\frac{b}{c}=\frac{3}{5}$; Solving each for b gives $b=\frac{9a}{5}, b=\frac{3c}{5}$. Setting these equal and cross multiplying gives $45a=15c$, then $\frac{a}{c}=\frac{1}{3}$.

12. D To rationalize the numerator, multiply by $\frac{\sqrt[3]{9}}{\sqrt[3]{9}}\bullet\frac{\sqrt[3]{3}}{12}=\frac{3}{12\sqrt[3]{9}}=\frac{1}{4\sqrt[3]{9}}$.

13. B Factor out $(2x+1)^2$,
$(2x+1)^2(x^2(2x+1)-4)=$
$(2x+1)^2(2x^3+x^2-4)$

14. D

15. B Working with the numerator first, $\frac{2(x+2)-x(x+1)}{(x+1)(x+2)}$, simplify then X by the reciprocal of the denominator gives
$\frac{-x^2+x+4}{(x+1)(x+2)}\bullet\frac{x+1}{1}=\frac{-x^2+x+4}{x+2}$

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16. D $z=\frac{kxy^2}{w}, 5=\frac{k\bullet 5\bullet 9}{6}$, gives
$k=\frac{2}{3}, z=\frac{2xy^2}{3w}$.

17. D $4(x+2)+x-5=Ax+B$,
$5x+3=Ax+B$, so $A+B=8$

18. D $\log_a 24=\log_a 8+\log_a 3=$
$3\log_a 2+\log_a 3=3(.4307)+$
$0.6826=1.9747$

19. B Write a system of 3 equations, 3 variables then solve.
$5=c, -5=4a+2b+5, -40=9a-3b+5;$
$a=-4, b=3, y=-4x^2+3x+5$

20. B $(7-x)(3x+5)=24x$, solving gives
$x=\frac{7}{3}, -5$, reject -5.

21. C sum $=-\frac{b}{a}$, product $=\frac{c}{a}$;
* I sum $=-\frac{3}{2}$, product $=-\frac{3}{2}$
* II sum $=\frac{1}{3}$, product $=\frac{1}{3}$
III. sum $=-3$, product $=3$

22. D Find the value of the determinant, set $=3$, then solve.
$28-8x-(-5x-2)=3, x=9$.

23. B Let one root $=a$, other is a^2.
Using product of roots: $-8=a^3$,
which makes $a=-2$ and $a^2=4$.
Using sum of roots: $-k=2$ so
$k=-2$.

24. E Using Descartes rule of signs
$-\ +\ -\ +\ +\ -$, 4 changes of sign

25. B $y=\dfrac{\begin{vmatrix}3&3&2\\1&2&-1\\1&6&1\end{vmatrix}}{\begin{vmatrix}3&-2&2\\1&4&-1\\1&1&1\end{vmatrix}}$

26. B $11=4+2r-3, r=5$

27. D Zeros are 4, $1+3i, 1-3i$.
To get quadratic using the complex zeros: sum of roots $-\frac{b}{a}=\frac{2}{1}$,
product of roots $\frac{c}{a}=\frac{10}{1}$, so $a=1$,
$b=-2, c=10$, gives the quadratic as
$x^2-2x+10$. Multiply this by $(x-4)$
gives $f(x)=x^3-6x^2+18x-40$.

28. C Solve the system $\begin{cases}x+y=8p\\x-y=6q\end{cases}$.
$x=4p+3q$

29. D Slopes must be equal.
$\frac{4}{3}=\frac{5-k}{-3}$ gives $k=9$.

30. C $(x+y)^2=x^2+2xy+y^2$;
$2xy=2b; \frac{y^2+x^2}{x^2y^2}=1$, so
$\frac{y^2+x^2}{b^2}=a$ makes $x^2+y^2=ab^2$;
$(x+y)^2=ab^2+2b$ or $b(ab+2)$