Barbara Nunn Test

2006-2007 *no calculator allowed*

SOLUTIONS

C 1. Use synthetic division

2	1	-7	k	4
		2	-10	-20+2k
	1	-5	-10+k	-16+2k

$-16+2k=8, k=12$

D 2. The maximum value would be the *y* coordinate of the vertex since the parabola opens downward.

$f(x)=-x^2-4x+8,$

$f(x)=-(x^2+4x+4)+8+4,$

$f(x)=-(x+2)^2+12$

A 3. Put the equation in slope intercept form: $y=-\frac{3}{2}x+\frac{7}{2}$, slope is $-\frac{3}{2}$

B 4. The reciprocal of the cube root of 64 squared is $\frac{1}{16}$.

C 5. $25_b=2b+5$, reversing the digits gives $5b+2$. The equation is $2(2b+5)=5b+2$, $b=8$.

E 6. The equation of variation is

$w=k\frac{xd^2}{L}$

C 7. Putting the equations in the same form gives $\begin{cases} x-y-2z=0 \\ -x+y-3z=1. \\ x+4y-z=0 \end{cases}$

Solving this system gives

$z=-\frac{1}{5}, y=\frac{1}{25}$ and y is what we want.

C 8. $\dfrac{-2^4\bullet\frac{3}{2}\bullet\frac{1}{2}\bullet-\frac{1}{2}}{3!}$ =

$\dfrac{-16\bullet\frac{3}{2}\bullet\frac{1}{2}\bullet-\frac{1}{2}}{6}$ = $\dfrac{\frac{48}{8}}{6}$ =1

B 9. $2x-x>x-3; x>-1, x\neq 1,3$

$(-1,1)\cup(3,\infty)$

D 10. $5x+2=3x, x=-1$ which does not solve the equation. $5x+2=-3x, x=\frac{5}{4}$, which does not solve the equation. No solution.

A 11. midpoint $\left(-\frac{1}{2},\frac{3}{2}\right)$, slope of segment is $\frac{1}{3}$, slope of $\perp$ bisector is -3, equation of line is $3x+y=0$.

A 12. $100x=53.\overline{3}$

$10x=5.\overline{3}$, subtracting these two equations gives $90x=48$, so $x=\frac{8}{15}$ in simplified form.

So, $n^2=225, m^2=64, 225-64=161$.

A 13. $(9+2i)(9-2i)=85$,

$85(5+i)=425+85i$

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A 14. $f(x)=3(x^2-4x+4)+16-12$,
$=3(x-2)^2+4$, line of symmetry passes through the x coordinate of the vertex since this parabola opens upward. The vertex is (2,4), so the line is x=2.

D 15. $f(-2x)=3(-2x)^2-5(-2x)-4$,
$=12x^2+10x-4$.

B 16. To find the length of a diagonal of a rectangular solid, use the formula $\sqrt{l^2+w^2+h^2}$. $\sqrt{9x^2+16x^2+144x^2}=39$
$\sqrt{169x^2}=39, 13x=39, x=3$. The longest dimension would be 12*x* which is 36.

D 17. Equation of the circle is $(x-4)^2+(x+2)^2=25$. The slope from the center to (7,2) is $\frac{4}{3}$. The slope of the tangent would be $-\frac{4}{3}$, and it passes through the point (7,2). The equation of the tangent would be $3x+4y=29.$

C 18. $x^2+y^2=500, x^2-y^2=-400$,
Solving this system gives $x=5\sqrt{2}, y=15\sqrt{2}$ making the ratio 3:1.

C 19. $.3x+200(.12)=.2(200+x), x=160$.

A 20. $3=\frac{2^x+7}{3-2^x}$, cross multiplying gives
$3\bullet 3-3\bullet 2^x=2^x+7;\ 2=2^x+3\bullet 2^x;$
$2=4\bullet 2^x; \frac{1}{2}=2^x; x=-1$

D 21. The circumference of the circle is x. So $2\pi r=x,$ making the radius of the circle $\frac{x}{2\pi}$. The area would be $\frac{x^2}{4\pi^2}\bullet\pi=\frac{x^2}{4\pi}.$

D 22. Out of the first 15 words, the student got 12 correct. After that, he got 11 right for each 15 answered. Let x represent the # of groups of 15 in which the student got 11 right. Therefore, $\frac{3}{4}=\frac{12+11x}{15+15x}$, making $x=3$. The student answered the original 15, then 3 groups of 15 which would be 60 words.

C 23. $6e^2=2e^3,$ factoring and solving gives $e=3.$

C 24. The altitude of the equilateral triangle is 6 so a side would be $4\sqrt{3}$. Draw the hexagon. Each triangle is equilateral. Since the hexagon is regular, each side of the original triangle is divided into 3 equal parts having a measure of $\frac{4}{3}\sqrt{3}$. Use the formula $\frac{6s^2\sqrt{3}}{4}$ to find the area of the hexagon is $8\sqrt{3}$.

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C 25. The area of the original isosceles triangle would be $\frac{1}{2}\bullet 10\bullet 12=60$.

The base of the original is 10, and the altitude is 12. The 2nd triangle must have a base of 24 and a height of 5. Let ½ the base be *x*. After drawing the altitude and using Pythagorem Theorem, the altitude would be $\sqrt{169-x^2}$. So the area is $60=x\bullet\sqrt{169-x^2}$. Solving this gives x as 12 or 5. It was 5 in the original triangle so it's 12 in the 2nd triangle.

C 26. To find the area use the product of the median and the height. The median is $\frac{1}{2}(2m+n+2m-n)=2m$.

Since the base angles are 45, we have a 45-45-90 triangle. The legs of the triangle would be the lower base minus the upper base divided by 2, which is *n*. There the area of the triangle is 2mn.

A 27. The sum of the lowest row is 33. The sum of the last column will also be 33 making the 2nd row, 3rd column number 13. The square in the middle would be 11 since the diagonal must have a sum of 33. Then we know that y+11+15=33 making y=7. The 1st row, 1st column number would be 14. Therefore, x+14+10=33, making x =9. So the sum of x and y is 16.

B 28. $\frac{width}{perimeter}=\frac{x}{9x}$. Since the perimeter is 9x, length plus width = $\frac{9}{2}x$. Since the width is *x*, length = $\frac{7}{2}x$. $\frac{x}{\frac{7}{2}x}=\frac{2}{7}$.

A 29. $\log_3(36x^2)=\log_3\left(8\bullet 18\right), x=2,-2$.

Reject the -2.

B 30.

	5	9
5	25	45
3	15	x

So the area of block *x* is 3 by 9 which is 27.