1. $Sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)=\frac{-\pi}{3}\rightarrow A$

2. $\frac{-3-4+5}{\left(\sqrt{9+4+1}\right)\left(\sqrt{1+4+25}\right)}=\frac{-2}{\sqrt{420}}=\frac{-1}{\sqrt{105}}=\frac{-\sqrt{105}}{105}\rightarrow C$

3. Transform equation to: $(x-6)^2+(y+4)^2=45$ so the center is (6,-4)
Find the slope between center and tangent point(-2). Tangent line has a slope that is the negative reciprocal of this. So equation is: $x-2y=-1\rightarrow A$

4. Draw picture such that the vertex will be the lowest point (0,4). $4p(y-4)=x^2$
plug in (40,24). 4p equals 80. Plug in 30 for X and solve for Y. Y equals $\frac{61}{4}\rightarrow D$

5. Use synthetic substitution and the rational root theorem: You will find the real solutions to be 2,-2 and -3, so the sum of the smallest and largest is $-1\rightarrow D$

6. $3!\bullet 6!=4320\rightarrow C$

7. Square both sides to get: $\sin^2 x+\cos^2 x+2\sin x\cos x=k^2$ therefore $\sin 2x=k^2-1$. Square both sides of this to get: $\sin^2 2x=k^4+1-2k^2$ substitute to get:
$1-\cos^2 2x=k^4+1-2k^2\rightarrow\cos^2 2x=-k^4+2k^2\rightarrow C$

8. Expand and then
substitute: $\cos\theta\cos\beta-\sin\theta\sin\beta=\left(\frac{4}{5}\right)\left(\frac{-12}{13}\right)-\left(\frac{3}{5}\right)\left(\frac{-5}{13}\right)=\frac{-48}{65}+\frac{15}{65}=\frac{-33}{65}\rightarrow A$

9. Draw picture: $\tan\theta=\frac{h}{12}$ and $\tan 2\theta=\frac{h}{4}$; $12\tan\theta=4\tan 2\theta\rightarrow 3\tan\theta=\frac{2\tan\theta}{1-\tan^2\theta}$
$3-3\tan^2\theta=2\rightarrow\tan^2\theta=\frac{1}{3}\rightarrow\tan\theta=\frac{\sqrt{3}}{3}$; $12\left(\frac{\sqrt{3}}{3}\right)=4\sqrt{3}\rightarrow D$

10. $X=\frac{k}{Y^2}\rightarrow X=\frac{k}{\left(\frac{1}{-}\right)^2 Y^2}\rightarrow X=\frac{4k}{Y^2}\rightarrow B$

11. The absolute value shifts the range to (0,3) and then the minus 4 shifts this down four units to $[-4,-1]\rightarrow B$

12. $(1-i)^2=-2i\rightarrow(-2i)^{\frac{k}{2}}=2^{12}\rightarrow k=24\rightarrow C$

13. Put the points in order and then use the determinant method for solving the area:

1	4	2	-6	1	
2	5	7	1	2	$=\frac{1}{2}\left[5+28+2-12-(8+10-42+1)\right]=23\rightarrow A$

14. $2(x+3)(2x-3)=\frac{1}{2}(-6x+20)$ $\quad 2\left(2x^2+3x-9\right)=-3x+10\rightarrow 4x^2+9x-28=0$
$(4x-7)(x+4)=0\rightarrow x=\left(\frac{7}{4},-4\right)$; -4 is extraneous so the only correct answer is B.

15. $4\cos x=2\csc x\rightarrow 2\sin x\cos x=1\rightarrow\sin 2x=1\quad 2x=\frac{\pi}{2}+2n\pi\rightarrow x=\frac{\pi}{4},\frac{5\pi}{4}$

The two intersection points are $\left(\frac{\pi}{4}, 2\sqrt{2}\right), \left(\frac{5\pi}{4}, -2\sqrt{2}\right)$ The slope is B.

16. $1+\cot^2 x = \csc^2 x \rightarrow 1+\frac{x^2}{y^2} = \frac{r^2}{y^2} \rightarrow x^2 + y^2 = r^2$

$1+\cot^2\frac{\theta}{7}+1+\cot^2\frac{2\theta}{7}+1+\cot^2\frac{3\theta}{7}+1+\cot^2\frac{4\theta}{7}=\frac{5}{7}$; $\frac{5}{7}-4=\frac{-23}{7}\rightarrow B$

17. $\frac{2\tan\theta}{1-\tan^2\theta}=\frac{3}{4}\rightarrow 3-3\tan^2\theta = 8\tan\theta$; $(3\tan\theta-1)(\tan\theta+3)=0\rightarrow\tan\theta=-3$

Since cosine is negative in QII, we get C.

18. Since the coefficient of the 4th and 10th terms are the same, we can deduce that there are 13 terms , so $n=12$. $a_8 = {}_{12}C_5 w^5(-f)^7 \rightarrow D$

19. First log both sides to get: $(\log Y)^2 = \log Y^5 - \log 10^6 \rightarrow (\log Y)^2 - 5\log Y + 6 = 0$

$(\log Y - 2)(\log Y - 3) = 0$; $Y = 10^2$ or $10^3 \rightarrow B$

20. 4p=12 so p=3; Go up 3 units and then 2p or 6 units left and right to get a diameter of 12 or radius of 6. The center of the circle will be the focus(2,7). The equation of the circle is: $(x-2)^2+(y-7)^2=36$ expand this out and you get $x^2+y^2-4x-14y+17=0\rightarrow B$

21. Use pythagorean theorem to get: $(\log x)^2+4\log x-12=0\rightarrow(\log x+6)(\log x-2)$

X=100; Use opposite over hypotenuse to get; $\frac{2}{2\sqrt{3}}\rightarrow C$

22. $(\cos\theta-\sin\theta)^2=1-2\sin\theta\cos\theta=1-\sin 2\theta$: $\cos 4\theta=1-2\sin^2 2\theta=\frac{15}{17}\rightarrow\sin^2 2\theta=\frac{1}{17}$:

$\sin 2\theta=\frac{\sqrt{17}}{17}\rightarrow 1-\sin 2\theta=1-\frac{\sqrt{17}}{17}\rightarrow D$

23. $\tan(\phi-\theta)=\frac{\tan\phi-\tan\theta}{1+\tan\phi\tan\theta}$ flip this fraction to solve for cotangent and you get:

$\frac{1+\frac{1}{x}\bullet\frac{1}{y}}{\frac{1}{x}-\frac{1}{y}}$ multiply top and bottom by xy to get B.

24. Set up a system of 3 equations and 3 variables: $x^2+y^2+cx+dy+f=0$

substitute the 3 point sin to get: $c-2d+f=-5$

$5c+4d+f=-41$

$10c+5d+f=-125$

If you solve this system you get c=-18, d=6, and f=25; Complete some squares to transform the equation and you get: $x^2-18x+81+y^2+6y+9=-25+81+9$

The radius squared equals 65 so the answer is B.

25. Use synthetic division with -3 and you will get a quotient of: x^2-4x+7.

Then use formula for product of roots $\frac{c}{a}=7\rightarrow A$

26. Switch X and Y and resolve for Y to get inverse. Then set inverse equal to original function and solve for N. $x = \frac{y+5}{y+n} \to xy + xn = y+5$; $xy - y = 5 - xn \to \frac{5-nx}{x-1} = \frac{x+5}{x+n}$

$x^2 + 4x - 5 = 5x + 5n - nx^2 - n^2 x \to n = -1 \to A$

27. $2+5+0=7 \to D$

28. Break this problem into two problems; First figure the possibilities for numbers 450-499 and then figure possibilities for 500-699. Add these together to get answer:
$1 \bullet 4 \bullet 6 + 2 \bullet 6 \bullet 6 = 24 + 72 = 96$; We divide this answer in half because we are only interested in odd numbers. The answer is 48 so D.

29.

$$\frac{\log_3 x}{\log_3 243} - \frac{\log_3 9}{\log_3 x} = \frac{3}{5} \to \frac{\log_3 x}{5} - \frac{2}{\log_3 x} = \frac{3}{5}$$

$$\to \left(\log_3 x\right)^2 - 10 = 3\log_3 x \to \left(\log_3 x\right)^2 - 3\log_3 x - 10 = 0$$

$$\left(\log_3 x - 5\right)\left(\log_3 x + 2\right) = 0 \to 3^5, 3^{-2} \to 3^3 = 27 \to C$$

30. An identity element is an element that when you perform an operation the value doesn't change. So we are looking for a column that is the same as the first column. Therefore the identity element is 2. answer is C.