P. $\cot 2\theta$

1. 6

2. 51

3. $\pm\sqrt{2}$

4. 63π

5. 6

6. 7

7. $\frac{4}{5}$

8. $\frac{18}{47}$

9. $\frac{22}{5}$ or $4\frac{2}{5}$ or 4.4

10. $\sqrt{15}$

11. $2k^2$

12. 125

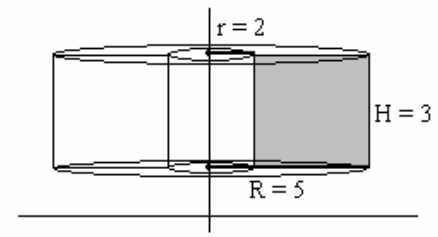
1. $8\left(\frac{\sqrt{3}}{2}\right)^2\left(\frac{1}{2}\right)+\left(\sqrt{3}\right)^2=8\left(\frac{3}{4}\right)\left(\frac{1}{2}\right)+3=3+3=6$ **ANSWER**: 6

2. $51^2-50^2=2601-2500=101$; a = 51, b = 50 **ANSWER**: 51

3. $\sqrt{4x^4}=4 \qquad 4x^4=16 \qquad x^4=4$

$x=\pm\sqrt[4]{4}=\pm4^{\frac{1}{4}}=\pm2^{\frac{2}{4}}=\pm\sqrt{2}$; other two solutions are imaginary **ANSWER**: $\pm\sqrt{2}$

4.



Revolution creates a cylinder with a cylindrical hole inside

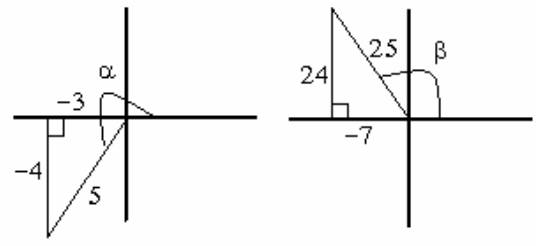
$V=\pi R^2H-\pi r^2H=\pi(5)^2(3)-\pi(2)^2(3)=75\pi-12\pi=63\pi$ **ANSWER**: 63π

5. $(2+2i)^8=(2\sqrt{2}cis45)^8=(2\sqrt{2})^8cis(45\cdot8)=(2^8\cdot2^4)cis360=2^{12}(1)=2^{12}=4^6$;
so x = 6 **ANSWER**: 6

6. $f(x)=\frac{2x}{\sqrt{-(x^2-7x+10)}}=\frac{2x}{\sqrt{-(x-2)(x-5)}}$

When 2 < x < 5, denominator is a non-zero real number, otherwise the function is undefined.
Integers which satisfy are 3 and 4; sum is 7 **ANSWER**: 7

7.



$\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta=\left(\frac{-4}{5}\right)\left(\frac{-7}{25}\right)-\left(\frac{-3}{5}\right)\left(\frac{24}{25}\right)=\frac{28+72}{125}=\frac{4}{5}$ **ANSWER**: $\frac{4}{5}$

8. When a card is drawn, 47 cards remain, 11 of which match in suit, and 7 of which match in face value

$P = \frac{7}{47},\ Q = \frac{11}{47},\ P + Q = \frac{18}{47}$ **ANSWER**: $\frac{18}{47}$

9. $\lim_{x\to 4}\left(\frac{2x-8}{x^2-3x-4}+\frac{x-4}{\sqrt{x}-2}\right)=\lim_{x\to 4}\left(\frac{2(x-4)}{(x+1)(x-4)}+\frac{(\sqrt{x}+2)(\sqrt{x}-2)}{\sqrt{x}-2}\right)=\lim_{x\to 4}\left(\frac{2}{x+1}+\sqrt{x}+2\right)$

$= \frac{2}{5}+2+2=\frac{22}{5}$ **ANSWER**: $\frac{22}{5}$ or $4\frac{2}{5}$ or 4.4

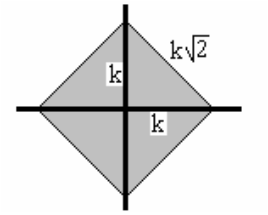
10. Multiplying both sides by e^{2x} and simplifying yields the equation

$2e^{4x}-17e^{2x}+30=0$ $(2e^{2x}-5)(e^{2x}-6)=0$ $e^{2x}=\frac{5}{2}$ or $e^{2x}=6$

$2x=\ln\frac{5}{2}$ or $2x=\ln 6$ $x=\ln\sqrt{\frac{5}{2}}$ or $x=\ln\sqrt{6}$

Sum of solutions = $\ln\sqrt{\frac{5}{2}}+\ln\sqrt{6}=\ln\sqrt{\frac{5}{2}\cdot 6}=\ln\sqrt{15}$; so p = $\sqrt{15}$ **ANSWER**: $\sqrt{15}$

11.



Area is a square with side $k\sqrt{2}$, area of square = $\left(k\sqrt{2}\right)^2 = 2k^2$ **ANSWER**: $2k^2$

12. $\frac{A}{x-2}+\frac{B}{x-4}=\frac{8x-26}{x^2-6x+8}$

$\frac{A(x-4)+B(x-2)}{x^2-6x+8}=\frac{8x-26}{x^2-6x+8}$

$Ax-4A+Bx-2B=8x-26$

Ax + Bx = 8x and -4A – 2B = -26

Solve system of equations to find A = 5, B = 3 $A^B = 5^3 = 125$ **ANSWER**: 125