1. **B**. $(x-1)^2+(x+1)= x^2-2x+1+x-1= \quad x^2-x$.

2. **C**. $e^{-2x} \neq e^{2x}$ for any x except 0.

3. **C**. Since sec(x) is 1/cos(x) and $\cos\left(\frac{\pi}{4}\right)=\frac{\sqrt{2}}{2}$ then sec(x)=$\frac{2}{\sqrt{2}}$ and squaring this gives 4/2=2.

4. **B**. Changing to standard form, we get 4x-3y=9. The distance from a point to a line is $\frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$ which gives $\frac{|0-3(5)-9|}{\sqrt{4^2+3^2}}=\frac{24}{5}$.

5. **B**. $f(10)=4^{11}=2^{22}$ and $g(12)=2^{11}$ and the product is $2^{22}\cdot 2^{11}=2^{33}$ so k = 33.

6. **A**. $y=\sqrt{1-\left(x-\frac{\pi}{2}\right)^2}$ is the top half of the graph of $y^2+(x-\frac{\pi}{2})^2=1$ which is a circle of radius 1 and center $\left(0,\frac{\pi}{2}\right)$. The max point is $\left(\frac{\pi}{2},1\right)$. y=sin(x) has the same max point.

7. **D**. $\sqrt[3]{x+1}=2;\ x+1=8$ so x=7.

8. **D**. $f\left(-\frac{1}{3}\right)=-3$ by the first part of the function, and $f(-3)=\frac{1}{2}+\frac{-1}{3}=\frac{1}{6}$ by the second part of the function.

9. **B**. f is always 9.

10. **B**. $f(x)=\sqrt{x+2}+(x+2)$ so f(14)=f(16-2)= 4+14=20 and f(7)=f(9-2)=3+9=12. The difference is 8.

11. **C**. The right hand side of the equation is 1 since $\sin\frac{\pi}{4}=\cos\frac{\pi}{4}$. So the equation $\sin x+\cos x=1$ is true for choice C.

12. **C**. The coefficient of the 3rd term is C(10, 2) which is $\frac{10!}{2!8!}$ and the coefficient of the 9th term is C(10, 8) which is the same. So the quotient is 1.

13. **C**. $f(7)=\sqrt{8+2\sqrt{7}}=\ \sqrt{(\sqrt{1}+\sqrt{7})^2}=1+\sqrt{7}$. So 1(7)=7.

14. **B**. $\log k+\log(k+2)=\log 48-\log 2 \quad \log k(k+2)=\log 24$, $k^2+2k=24$
so $k^2+2k-24=0,\ (k-4)(k+2)=0$ so k=4 and $\log_2(1/4)=-2$.

15. **A**. The angles are 101, 101+d, 101+2d, … , 101+6d. The sum is 180(7-2)=900. 707+21d=900. 21d=193, so largest angle is 101+6(193/21) is 156 to the nearest degree. The sum of the digits is 12.

16. **C**. The sum of the roots of f is 3. The sum of the roots of g is 10. So the missing root must be 10-3=7.

17. **C**. The smallest number of integral factors for c^n is (n+1). Since c cannot be 2 (x is odd) then the smallest value for c is 3. 3^4 has five factors: 1, 3, 9, 27, 81.

18. **B**. The probability of at least one heads is the same as 1 minus the probability of no heads. So P(2)=1-1/4=3/4. P(3)=1-1/8= 7/8 and P(n)=$\frac{2^n-1}{2^n}$ and since this is greater than 15/16, we get $2^n>16$ and so $n>4$ Since n is an integer (flips of coins), n=5.

19. **A**. f(10) means there are 20 people and we want the seat opposite to seat 10. Pattern: for four seats, opposite seat 1 is seat 3 and in general, opposite seat n is seat (n+2). For six seats, opposite seat n is

seat (n+3) and for twenty seats, opposite seat n is seat (n+10). So opposite seat 10 is seat 20.

20. **D**. f and g are inverses so their composite is equal x, so f(g(1))=1.

21. **D**. $f(x)=16cis\left(-\frac{\pi}{4}\right)$ and $\left(16cis\left(-\frac{\pi}{4}\right)\right)^{\frac{1}{4}} = 2cis\left(-\frac{\pi}{16}\right)$ by DeMoivre's Theorem. Each fourth root occurs at intervals of $2\pi/4=\frac{\pi}{2}$ and since $2\pi+\frac{-\pi}{16}=\frac{31\pi}{16}$, and angles for the other roots are $\frac{21\pi}{16},\frac{15\pi}{16},\frac{7\pi}{16}$.

22. **A**. $f(g(x))=\frac{\sqrt{(x^2-1)-1}}{(x^2-1)^2-4}$ so $(x^2-1)-1$ must be ≥ 0 and $x^2\geq 2$ so $|x|\geq\sqrt{2}$. Then $(x^2-1)^2-4 \neq 0$ and $(x^2-1)^2\neq 4$ and $x^2-1\neq\pm 2$ so $x^2\neq 3,\ x^2\neq -1$ so $x\neq\pm\sqrt{3}$. This gives domain $(-\infty,-\sqrt{3})\cup(-\sqrt{3},-\sqrt{2}]\cup\ [\sqrt{2},\sqrt{3})\cup(\sqrt{3},\infty)$.

23. **A**. $f(t)=\frac{\cancel{2}00}{1+e^{-0.1t}}=\frac{\cancel{2}00\sqrt{e}}{1+\sqrt{e}}$ and cross multiply to get $\cancel{\sqrt{e}}+e^{\frac{1}{2}-\frac{1}{10}t}=1+\cancel{\sqrt{e}}$ so $e^{\frac{1}{2}-\frac{1}{10}t}=1$ when the exponent is 0 or when t=5. This is 5 hours after midnight. 5 AM.

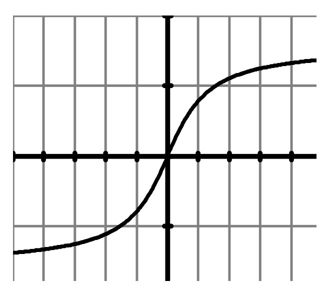
24. **B**. $(\log_4 25)(3\log_5 2)$ = $\left(\frac{2\log 5}{2\log 2}\right)\left(\frac{3\log 2}{\log 5}\right)=3$

25. **C**. f(20)=12 means 20 people were surveyed and 12 liked coffee and 18 liked tea. 12+18=30 so 10 were counted twice.

26. **C**. The sum is the first bounce plus the sum of an infinite series.

$x+\frac{4}{5}(2x)+\frac{16}{25}(2x)+\ldots$ = $x+\frac{a_1}{1-r}=x+\frac{\frac{4}{5}(2x)}{1-\frac{1}{5}}=x+8x$. Getting 9x=7200 gives the initial height x is 800.

27. **D**.The arctan(x) function has asymptotes at x=pi/2 and x= -pi/2.



28. **D**. At t=1, D=0.5; at t=2 d=1, and at t=n D=n/2. The centers are 12 units apart when the circles are tangent to each other. So at t=24, D=12 and D(24)=12.

29. **B**. $\sqrt{x^2-2x+1}=\sqrt{(x-1)^2}=|x-1|$ and when $x<1$, $f(x)=-(x-1)=1-x$. f(a)-f(b)= (1-a)-(1-b) = b-a.

30. **D**. The possible products for f(2), f(3) are

a, b	a*b	a, b,c	a*b*c
2, 4	8	2,4,6	48
2, 6	12	2,4,8	64
2, 8	16	2,4,16	128
2, 16	32	2,6,8	96
4, 6	24	2,6,16	192
4, 8	32	2,8,16	256
4,16	64	4,6,8	192
6, 8	48	4,6,16	384
6,16	96	4,8,16	512
8, 16	128	6,8,16	768

The only ways f(2)>f(3) are
64 > one prod. 96< two prod.
128<three products 6/100 = 3/50