answers:

1. C
2. A
3. D
4. C
5. A
6. D
7. B
8. C
9. A
10. D
11. B
12. D
13. B
14. D
15. E
16. A
17. C
18. B
19. D
20. B
21. C
22. C
23. B
24. D
25. B
26. C
27. B
28. A
29. B
30. A

1. ${}_7C_3(3x)^4(2)^3 = 35(81x^4)(8) = 22680x^4 \to C$

2. $(-1)^3 - (r-1) + 3 = 5 \to -r + 3 = 5 \to r = -2 \to A$

3. $\dfrac{\sqrt{4+4}}{\sqrt{9+16}} = \dfrac{2\sqrt{2}}{5} \to D$

4. $\dfrac{{}_2C_1 \bullet {}_7C_4}{{}_{10}C_6} = \dfrac{70}{210} = \dfrac{1}{3} \to C$

5. $\dfrac{x^2}{9} + \dfrac{y^2}{4} = 1 \to 2a + 2c = 2\sqrt{9} + 2\sqrt{5} = 6 + 2\sqrt{5} \to A$

6. $1 = A + B + C$
$6 = 4A + 2B + C \qquad 3A + B = 5$
$17 = 9A + 3B + C \qquad 5A + B = 11 \qquad 2A = 6 \to A = 3, B = -4, C = 2 \to 3 - -4 + 2 = 9 \to D$

7. $\lim\limits_{n\to\infty} \dfrac{3}{n^2} \bullet 2(1+2+3+\ldots+n) = \lim\limits_{n\to\infty} \dfrac{3}{n^2} \bullet 2\dfrac{n(n+1)}{2} = 3 \to B$

8. $\dfrac{8}{(k+2)(k-2)} = \dfrac{A}{k+2} + \dfrac{B}{k-2} \to 8 = A(k-2) + B(k+2) \to 4B = 8 \to B = 2 \to A = -2$

$\left(2 - \dfrac{2}{5}\right) + \left(\dfrac{2}{2} - \dfrac{2}{6}\right) + \left(\dfrac{2}{3} - \dfrac{2}{7}\right) + \left(\dfrac{2}{4} - \dfrac{2}{8}\right) + \ldots = 2 + 1 + \dfrac{2}{3} + \dfrac{1}{2} = \dfrac{25}{6} \to C$

9. $mx^3 + nx^2 + 1 = (x^2 - x - 1)(mx - 1) = mx^3 + (-m-1)x^2 + (1-m)x + 1$
$n = -m - 1$
$0 = 1 - m \to m = 1 \to n = -2 \to A$

10. $\dfrac{(x^2 - (4y^2 - 4y + 1))(x+2y)}{(x^2 - 4y^2 - x + 2y)(x^2 - 4y^2 2y + x)} = \dfrac{\left[x^2 - (2y-1)^2\right](x+2y)}{\left[(x-2y)(x+2y) - x + 2y\right]\left[(x-2y)(x+2y) + x + 2y\right]} = \dfrac{(x-2y+1)(x+2y-1)(x+2y)}{(x-2y)(x+2y-1)(x+2y)(x-2y+1)} \to D$

11.

C	A	T
X/100	4	x/25
1	4/3	4/3
(x+20)/100	16/3	X/25 +4/3

$\left(\frac{x+20}{100}\right)\left(\frac{16}{3}\right)=\frac{x}{25}+\frac{4}{3}\rightarrow 16x+320=12x+400\rightarrow 4x=80\rightarrow x=20\rightarrow 20+20=40\rightarrow B$

12. $\frac{1}{-27+28}\begin{bmatrix}9 & 4\\ -7 & -3\end{bmatrix}=1+4=5\rightarrow D$

13. $3^{2x-2}-3^{x-1}-2=0\rightarrow 3^{2x}-3\left(3^{x}\right)-18=0\rightarrow\left(3^{x}-6\right)\left(3^{x}+3\right)=0\rightarrow 3^{x}=6\rightarrow B$

14. If you consider all subsets must contain L,U then the question boils down to subsets of Z, L,U. There are 8 of those. 6 proper subsets, the empty set, and the entire subset. D

15. $y^2-4y+4=16x+64$
$\left(y-2\right)^2=16\left(x+4\right)\rightarrow 4p=16\rightarrow E$

16. Diverges: $\left|r\right|=\sqrt{2}>1$ A

17. C

18. a=0 because even function:
$1=16+4b+c \qquad 4b+c=-15$
$11=81+9b+c \qquad 9b+c=-70\rightarrow 5b=-55\rightarrow b=-11\rightarrow c=29\rightarrow 18\rightarrow B$

19. $\frac{4^{11}(4^{-1}+4^{-2}+4^{-3}+\ldots+4^{-10})}{4^{-1}+4^{-2}+4^{-3}+\ldots+4^{-10}}=4^{n}\rightarrow n=11\rightarrow D$

20. $x^2-4>0\rightarrow\left(x-2\right)\left(x+2\right)>0\rightarrow B$

21. $\sin\left(3x\right)=\sin\left(2x+x\right)=\sin 2x\cos x+\cos 2x\sin x=2\sin x\cos^2 x+(1-2\sin^2 x)\sin x=$
$2\left(\frac{2}{5}\right)\left(\frac{\sqrt{21}}{5}\right)^2+\left[1-2\left(\frac{2}{5}\right)^2\right]\left(\frac{2}{5}\right)=\left(\frac{4}{5}\right)\left(\frac{21}{25}\right)+\left[\frac{2}{5}-2\left(\frac{2}{5}\right)^3\right]=\frac{84}{125}+\left(\frac{50}{125}-\frac{16}{125}\right)=\frac{118}{125}\rightarrow C$

22.Radians!! 2.1+x=3.14 x=1.04 C

23. $\sin\left(A-B\right)=\sin A\cos x-\cos A\sin B=\left(\frac{3}{5}\right)\left(\frac{12}{13}\right)-\left(\frac{4}{5}\right)\left(\frac{5}{13}\right)=\frac{36-20}{65}\rightarrow B$

24.

	Hurricane yes	Hurricane no	total
Freeze yes	.22	.22	.44
Freeze No	.03	.53	.56
	.25	.75	1

$\frac{.22}{.25} = .88 \to D$

25. Get perpendicular line and find intersection:

$m = \frac{1}{5} \to (12,10) \to y = \frac{1}{5}x + b \to y = \frac{x}{5} + \frac{38}{5} = -5x + 18$

$x + 38 = -25x + 90 \to 26x = 52 \to x = 2, y = 8 \to 10 \to B$

26. $i - 2 - 3i + 4 \quad 5i - 6 - 7i + 8$. Every block of 4 sums to 2-2i. We therefore need 24 blocks of 4 plus 1 extra, so answer is 97!! C

$L \le 0 \to U = 10 \to L = 12$

27. $L > 0 \to 2L + U = 10 \to y \ge 0 \to L = 12 \to U = -14$

$U < 0 \to L - 2U = 12 \to L = \frac{32}{5}, U = \frac{-14}{5}, L + U = \frac{18}{5} \to B$

28. $\cos x \cos y + \sin x \sin y = ?$

$\sin^2 x + 2\sin x \sin y + \sin^2 y = \frac{5}{3}$

$\cos^2 x + 2\cos x \cos y + \cos^2 y = 1$

$2 + 2\sin x \sin y + 2\cos x \cos y = \frac{8}{3} \to 2(\sin x \sin y + \cos x \cos y) = \frac{2}{3} \to \frac{1}{3} \to A$

29.Draw picture!! $3S = \frac{S^2\pi}{3} \to S = \frac{9}{\pi}\ Diam = \frac{2S}{\sqrt{3}} = \frac{18}{\pi\sqrt{3}} = \frac{6\sqrt{3}}{\pi} \to B$

30.Graph the 2 points in the polar plane then use law of cosines to find distance!!

$c^2 = 3^2 + 5^2 - 2(3)(5)\cos\left(\frac{5\pi}{3} - \frac{5\pi}{6}\right)$

$c^2 = 34 - 30\cos\frac{5\pi}{6} = 34 - 30\left(\frac{-\sqrt{3}}{2}\right) = 34 + 15\sqrt{3} \to A$