1. Use the formula –*b*/*a*. The x^4 term is 0 therefore 0 divided by $\frac{2}{5}$ is 0. **C**

2. $4w + 3x - y - 6z = 2$
$2(-2w + 2x + 2y + 3z = 3)$
$w - 6x - 2y = 4$
$z = 2$

When the second equation is multiplied by 2 and then the four equations are added together, you get $w + x + y + z = 14$ **B**

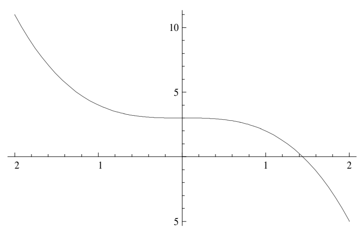
3. Multiply both sides by x^2-2x-3 and get $x^2-6x-11+x^2+3x+2=3x^2-10x+3$. Simplify to $x^2-7x+12$, roots are 3 and 4. 3 would make equation undefined therefore only 4 works
B

4. $\sqrt{a-\sqrt{b+\sqrt{a-\sqrt{b...}}}}=\sqrt{a-\sqrt{b+4}}=4$. $a-\sqrt{b+4}=16$. $(a-16)^2=b+4$. $b=a^2-32a+252$.
D

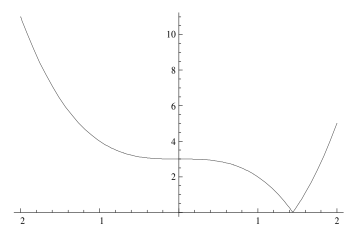
5. First ln both sides to obtain $x^2-2x+3=\ln 1$. $\ln 1 = 0$, so use –*b*/*a* to find the sum of the roots.
D

6. $3x-6<3 \to 3x<9 \to x<3$; $3x-6>-3 \to 3x>3 \to x>1$. (1, 3). **B**

7. This is the graph of $-x^3+3=y$:

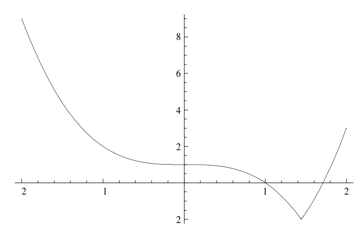


Then $|-x^3+3|=y$ reflects all negative values of the first graph about the x-axis. It looks like:



Then $|-x^3+3|+2=y$ shifts the second graph down by 2.
The inequality shades the graph above the curve, so the inequality goes through quadrants I, II and IV

E



8. $\frac{3^{x^2}}{27^{\frac{8x}{3}}}=\frac{1}{81} \to \frac{3^{x^2}}{3^{8x}}=3^{-4} \to 3^{x^2-8x}=3^{-4}$. $x^2-8x+4=0,\ x=4\pm 2\sqrt{3}$. $\frac{4}{2}-3=-1$. **A**

9. Using the elimination method, multiply the first equation by 5 and the second equation by 3. When the two equations are added together y cancels out. To make this have no solutions x also has to cancel out. Set $3a$ equal to -20 and get $\frac{-20}{3}$. **D**

10. $\pm\frac{p}{q}$, 3 is the only number not possible. **D**

11. $\frac{4}{3}(-3x)^3 - 2(-3x)^2 + \frac{1}{3}(-3x) - 1 \rightarrow -36x^3 - 18x^2 - x - 1$ **E**

12. When $x \geq 5$, you get $a < a$ for all values of a. So $x < 5$. **B**

13. $\log_a x \bullet \log_b a = \log_b x$. $\log_3 4 \bullet \log_2 3 = x^2 - 4x - 19 \rightarrow \log_2 4 = x^2 - 4x - 19$. Solve for x, roots are 7 and 3. The positive difference is 10. **D**

14. $\left(\frac{6!}{4!2!}\right)(3)^4(-2)^2 = 4860$ **D**

15. $[3 + (-2)]^6$ is the sum of all the coefficients. So subtract by the constant term $(-2)^6$ and get -63. **C**

16. The highest point is at the y coordinate of the vertex (2, 69). The x coordinate gives time. **B**

17. $g(x) = \frac{rx+n}{qx-m} \rightarrow g_A(x) = \frac{-rm-nq}{(qx-m)^2} \rightarrow -rm - nq = (qx-m)^2 \rightarrow q^2x^2 - 2qmx + m^2 + rm + nq = 0$; product of the roots is $\frac{c}{a} = \frac{m^2 + rm + nq}{q^2}$. **A**

18. $f(x+2) = x^2 + 3x - 7$. Set $u = (x+2)$, $u^2 = x^2 + 4x + 4$. $f(u) = u^2 - u - 9 \rightarrow \frac{f(x)}{3} = \frac{x^2}{3} - x - \frac{9}{3}$. **C**

19. $(A+2)(x+2) + B(x-3) = 12x - 11 \rightarrow Ax + 2A + 2x + 4 + Bx - 3B = 12x - 11$. Separate into $Ax + 2x + Bx = 12x \rightarrow A + B = 10$ and $2A + 4 - 3B = -11 \rightarrow 2A - 3B = -15$. Solve the system to obtain $B = 7$, $A = 3$. **B**

20. $\left(\frac{5-4i}{4+3i}\right)\left(\frac{4-3i}{4-3i}\right) = \frac{8-31i}{25}$. $\left|\frac{8-31i}{25}\right| = \sqrt{\left(\frac{8}{25}\right)^2 + \left(\frac{31}{25}\right)^2} = \frac{\sqrt{41}}{5}$. **D**

21. $\begin{vmatrix} x & 0 & 1 \\ x & x & 3 \\ 2 & 1 & 2 \end{vmatrix} = 16 \rightarrow 2x^2 + x - 2x - 3x = 6 \rightarrow x^2 - 2x - 3 = 0$. $x = 3$.

$$\begin{vmatrix} 3 & 0 & 1 \\ 3 & 3 & 3 \\ 2 & 1 & 2 \end{vmatrix}^{-1} = \frac{1}{6}\begin{vmatrix} \begin{vmatrix} 3 & 3 \\ 1 & 2 \end{vmatrix} & -\begin{vmatrix} 3 & 3 \\ 2 & 2 \end{vmatrix} & \begin{vmatrix} 3 & 3 \\ 2 & 1 \end{vmatrix} \\ -\begin{vmatrix} 0 & 1 \\ 1 & 2 \end{vmatrix} & \begin{vmatrix} 3 & 1 \\ 2 & 2 \end{vmatrix} & -\begin{vmatrix} 3 & 0 \\ 2 & 1 \end{vmatrix} \\ \begin{vmatrix} 0 & 1 \\ 3 & 3 \end{vmatrix} & -\begin{vmatrix} 3 & 1 \\ 3 & 3 \end{vmatrix} & \begin{vmatrix} 3 & 0 \\ 3 & 3 \end{vmatrix} \end{vmatrix} = \frac{1}{6}\begin{vmatrix} 3 & 0 & -3 \\ 1 & 4 & -3 \\ -3 & -6 & 9 \end{vmatrix} = \frac{1}{6}$$ **C**

22. We need to find the values of *x* such that the sum of any two equations is greater than the third. Consider the following equations (remember, 0 is a lower bound and 10 is an upper bound, so they are placed where appropriate):

(I) $x^2 + 3x + 2 + 2x^2 - 3x + 2 > 4x^2 - 5x + 2 \rightarrow x^2 - 5x - 2 < 0 \rightarrow 0 < u < \frac{5+\sqrt{33}}{2}$

(II) $x^2 + 3x + 2 + 4x^2 - 5x + 2 > 2x^2 - 3x + 2 \rightarrow 3x^2 + x + 2 > 0$ which is true for all positive *x*.

(III) $2x^2 - 3x + 2 + 4x^2 - 5x + 2 > x^2 + 3x + 2 \rightarrow 5x^2 - 11x + 2 > 0 \rightarrow x < \frac{1}{5} \cup x > 2$

Hence, on the intervals $\left(0, \frac{1}{5}\right) \cup \left(2, \frac{5+\sqrt{33}}{2}\right)$, the triangle exists; the probability is just the sum of the lengths of these intervals divided by the length of the total interval (10), or $\frac{7+5\sqrt{33}}{100}$. **B**

23. $\left(\frac{2\sqrt{6-2\sqrt{5}}}{\sqrt{6+2\sqrt{5}}}\right)\left(\frac{\sqrt{6+2\sqrt{5}}}{\sqrt{6+2\sqrt{5}}}\right) = \frac{2\sqrt{16}}{6+2\sqrt{5}} = \left(\frac{4}{3+\sqrt{5}}\right)\left(\frac{3-\sqrt{5}}{3-\sqrt{5}}\right) = \frac{4(3-\sqrt{5})}{4} = 3-\sqrt{5}$

$a = 3$, $b = -1$, $c = 5$; $a + b + c = 7$ **C**

24. Divide by $x - 2$ using synthetic division and get $x^2 + 4$. The two non-real roots are $2i$ and $-2i$. **B**

25. $3by - 6y - b + 3by = 5b \rightarrow y(6b-6) = 6b \rightarrow y = \frac{b}{b-1}$. **D**

26. Svetlana gets $\frac{1000\left(1+\frac{1}{2}\right)^{2\times2}}{5} = 200\left(\frac{81}{16}\right) = \frac{2025}{2} = \$1012.5$; Sophia gets $500\left(1+\frac{1}{10}\right)^2 = \$605$;

1012.5 - 605 = \$407.50. **C**

27. $\frac{|Ax_1 + By_1 + C|}{\sqrt{A^2+B^2}}$. First adjust the equation of the line to $3x - 4y + 6 = 0$. $\frac{|3(4)-4(7)+6|}{\sqrt{(3)^2+(-4)^2}} \rightarrow \frac{10}{5} \rightarrow 2$ **B**

28. 20% cut is $0.8x$. Then the 20% increase is 1.2 * $0.8x$, yielding 96% **C**

29. The slope of $5x-2y=1$ is $\frac{5}{2}$, a line perpendicular to it has slope $-\frac{2}{5}$. $2(3)+5(2)=16$, so the equation of such a line that goes through the point (3, 2) has the equation $2x+5y=16$.
C

30. $x^2+2x-7>8 \rightarrow (x+5)(x-3)$. -5 and 3 are the critical points, put on a number line and test zones.

$x < -5$, $x > 3$. **D**