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

1. $\left(\sqrt[3]{9}\right)\left(\sqrt[4]{16}\right)\left(\sqrt[6]{36}\right) = \left(3^{2/3}\right)(2)\left(6^{1/3}\right) = 2\sqrt[3]{54} = 6\sqrt[3]{2} \Rightarrow 6+3+2=11 \Rightarrow$ A

2. $f(x+3)$ and $g(x+3)$ shifts $f(x)$ and $g(x)$ each 3 units left, so $(5,1)$ shifts to $(2,1)$ $\Rightarrow$ C

3. $1-\dfrac{1}{1-x} = \dfrac{1-x-1}{1-x} = \dfrac{-x}{1-x} = \dfrac{x}{x-1}$

$\dfrac{1}{\dfrac{x}{x-1}} = \dfrac{x-1}{x} \Rightarrow \dfrac{1}{1-\dfrac{x-1}{x}} = \dfrac{x}{x-x+1} = x \Rightarrow$ E

4. $i^{4n+1} = i$, not $-i \Rightarrow$ C is false

5. $x + \sqrt{x-4} = 6 \Rightarrow \sqrt{x-4} = 6 - x \Rightarrow x - 4 = 36 - 12x + x^2$

$0 = x^2 - 13x + 40 \Rightarrow 0 = (x-8)(x-5) \Rightarrow x = 8$ or $x = 5$

$8 + \sqrt{4} \neq 6$, so 8 is extraneous ; $5 + \sqrt{1} = 6$, so 5 is the only root $\Rightarrow$ B

6. $f(2) = f(1) + 2 = 3$

$f(3) = f(2) + 3 = 6$

$f(4) = f(3) + 4 = 10$

$f(5) = f(4) + 5 = 15$

$\therefore f(4) + f(5) = 25 \Rightarrow$ C

7. By the rational root theorem, $\dfrac{3}{2}$ is not a possible rational root because 2 is not a factor of the leading coefficient, 9. $\Rightarrow$ D

8. P (pass at least one) = 1 – P (pass neither) = 1 – (0.7)(0.4) = 0.72 $\Rightarrow$ D

9. The units digit of 2^n ($n \in$ {Natural Numbers}) repeats in a cycle of 4 $\Rightarrow$ 2, 4, 8, 6, 2, 4, …

and the units digit of 3^n also repeats in a cycle of 4 $\Rightarrow$ 7, 9, 3, 1, 7, 9, …

Since $2006 \div 4$ leaves a remainder of 2, $X = 4$ and $Y = 9$, so $XY = 36$. $\Rightarrow$ D

10. $W = \dfrac{kX}{Y^2}$ so when X and Y are both increased by 25% $\Rightarrow W = \dfrac{k(1.25X)}{(1.25Y)^2}$,

which reduces to $W = \dfrac{kX}{1.25Y^2} = \dfrac{4}{5} \bullet \dfrac{kX}{Y^2} \Rightarrow$ W is decreased by 20% $\Rightarrow$ C

11. $2^{-n} \bullet 8^{n-1} \bullet 4^{n+3} \div 16^{n} = 2^{-n} \bullet 2^{3n-3} \bullet 2^{2n+6} \div 2^{4n} = 2^{3} = 8 \Rightarrow$ A

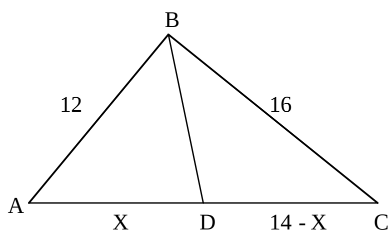
12. $\dfrac{\frac{b}{a} - k}{\frac{1}{b} - \frac{1}{a}} = -b$, so multiplying both sides by $\frac{1}{b} - \frac{1}{a} \Rightarrow -1 + \frac{b}{a} = \frac{b}{a} - k \Rightarrow k = 1 \Rightarrow$ D

13. By the angle bisector theorem:

$$\frac{X}{12} = \frac{14 - X}{16}$$

$$16X = 168 - 12X$$

$$28X = 168 \Rightarrow X = 6 \Rightarrow C$$



14. $(\log_p x^3)(\log_4 p) = 6 \Rightarrow \dfrac{\log x^3}{\log p} \bullet \dfrac{\log p}{\log 4} = 6 \Rightarrow \dfrac{\log x^3}{\log 4} = 6 \Rightarrow \log_4 x^3 = 6$

$\Rightarrow x^3 = 4^6 \Rightarrow x = 16 \Rightarrow$ B

15. $x^3 + x^2 - 9x - 9 = 0 \Rightarrow (x+3)(x-3)(x+1) = 0 \Rightarrow x = -3 \text{ or } 3 \text{ or } -1 \Rightarrow A = 3$

$\dfrac{12}{x-1} - \dfrac{8}{x} = 2 \ (x \neq 1 \text{ or } 0) \Rightarrow 12x - 8(x-1) = 2x(x-1) \Rightarrow x^2 - 3x - 4 = 0$

$\Rightarrow x = 4 \text{ or } -1 \Rightarrow B = 3$

Let $y = x^2 - 1 \Rightarrow y^2 - 5y + 4 = 0 \Rightarrow (y-4)(y-1) = 0$

$\Rightarrow x^2 - 1 = 4 \text{ or } 1 \Rightarrow x^2 = 5 \text{ or } 2 \Rightarrow x = \sqrt{5} \text{ or } -\sqrt{5} \text{ or } \sqrt{2} \text{ or } -\sqrt{2} \Rightarrow C = 10$

$A + B + C = 16 \Rightarrow$ D

16. $8(P) \bullet 6(VP) \bullet 12(S) = 576 \Rightarrow$ C

17. Let the roots of $x^2 + 4x + 5 = 0$ be p and q. Then, $p + q = -4$ and $pq = 5$.

$p^2q^2 = (pq)^2 = c = 25$

$p^2 + q^2 = (p+q)^2 - 2pq = -b = (-4)^2 - 2(5) = 6 \Rightarrow b = -6$

$b + c = 19 \Rightarrow$ B

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18. $x + y - 10 = 0 \Rightarrow A = 1,\ B = 1,\ C = -10$ and $y = -x + 7$ contains (0, 7) $\Rightarrow x_1 = 0$ and $y_1 = 7$

$$d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}} = \frac{|0 + 7 - 10|}{\sqrt{1+1}} = \frac{3}{\sqrt{2}} = \frac{3\sqrt{2}}{2} \Rightarrow \text{A}$$

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19. ${}_9P_2 = \frac{9!}{7!} = 72$ | $\begin{vmatrix} 4 & 2 \\ 10 & 5 \end{vmatrix} = 20 - 20 = 0$ | $C_2 = \frac{4!}{2!2!} = 6$ | $3! = 6$

$$X = \frac{72}{0 + 6 + 6} = 6 \Rightarrow 2^6 = 64 \Rightarrow \text{D}$$

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20. This equation will be true if $x^2 - 9x + 19 = 1 \Rightarrow (x-3)(x-6) = 0 \Rightarrow x = 3$ or 6

or $x^2 + 2x - 3 = 0$ (and $x^2 - 9x + 19 \neq 0$) $\Rightarrow (x+3)(x-1) = 0 \Rightarrow x = -3$ or 1

or $x^2 - 9x + 19 = -1$ (and $x^2 + 2x - 3$ is even) $\Rightarrow (x-5)(x-4) = 0 \Rightarrow x = 5$ or 4

$5^2 + 2(5) - 3$ is even, but $4^2 + 2(4) - 3$ is odd, so 4 is extraneous $\Rightarrow 3 + 6 - 3 + 1 + 5 = 12 \Rightarrow$ B

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21. $3x + 2yi = -63 - 54i \Rightarrow 3x = -63$ and $2y = -54 \Rightarrow x = -21$ and $y = -27$

$\Rightarrow x + y = -48 \Rightarrow$ B

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22. The parabola opens right with vertex (1, 2) $\Rightarrow p = 2 \Rightarrow 4p = 8 \Rightarrow |a| = \frac{1}{8} \Rightarrow a = \frac{1}{8}$

Vertex form : $x - h = a(y-k)^2 \Rightarrow x - 1 = \frac{1}{8}(y-2)^2 \Rightarrow 8x - 8 = y^2 - 4y + 4$

$\Rightarrow 0 = y^2 - 8x - 4y + 12 \Rightarrow$ A

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23. $q^{52} = q^{-4}r^7 \Rightarrow q^{56} = r^7 \Rightarrow r = q^8$ so $q^{-4} \bullet q^8 = q^p \Rightarrow q^4 = q^p \Rightarrow p = 4 \Rightarrow$ C

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24. $kx^2 + 8x + 3 = 0$ will have imaginary roots if $b^2 - 4ac < 0 \Rightarrow 64 - 12k < 0 \Rightarrow k > \frac{16}{3} \Rightarrow$ B

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25. i is false (Domain $= \{x : x > 0\}$); ii is false (strictly increasing); iii, iv, and v are all true $\Rightarrow$ C

26. Let measures of exterior angle $= x$ and interior angle $= 5x \Rightarrow 6x = 180 \Rightarrow x = 30$ and $5x = 150$

$\dfrac{(n-2)\bullet 180}{n} = 150 \Rightarrow 180n - 360 = 150n \Rightarrow n = 12 \Rightarrow 12(150) = 1800 \Rightarrow$ D

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27. $25(x^2 - 2x + 1) + 9(y^2 + 4y + 4) = 164 + 25 + 36 \Rightarrow \dfrac{(x-1)^2}{9} + \dfrac{(y+2)^2}{25} = 1$

Center is $(1, -2)$ and major axis is vertical $\Rightarrow c^2 = 25 - 9 \Rightarrow c = 4 \Rightarrow$ foci are $(1, 2)$ and $(1, -6)$

Sum of y – coordinates $= -4 \Rightarrow$ B

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28. $\sum_{x=1}^{3}(ax + b) = 15 \Rightarrow a + b + 2a + b + 3a + b = 15 \Rightarrow 6a + 3b = 15 \Rightarrow 2a + b = 5$

$\sum_{x=2}^{4}(ax + b) = 21 \Rightarrow 2a + b + 3a + b + 4a + b = 21 \Rightarrow 9a + 3b = 21 \Rightarrow 3a + b = 7$

Solving the system $\Rightarrow a = 2$ and $b = 1 \Rightarrow a + b = 3 \Rightarrow$ C

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29. $f(x) = x^4 + 5x^2 + 2x - 11$ has 1 sign change $\Rightarrow A = 1$

$f(-x) = x^4 + 5x^2 - 2x - 11$ has 1 sign change $\Rightarrow B = 1 \Rightarrow A - B = 0 \Rightarrow$ C

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30. $f(x) = \dfrac{(x-5)(x+3)}{(x+3)(x-2)}$ i is false (vertical asymptote is $x = 2$); ii is true;

iii is false (horizontal asymptote is $y = 1$); iv is true (5 is the real zero) $\Rightarrow$ C