

Individual Solutions .

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

Team Solutions.

1. $252\sqrt{21}$

2. $\frac{\pi}{2}$

3. 14

4. 88

5. 10

6. $\frac{\pi}{6}$

7. 5

8. 3

9. 1.25

10. $\frac{1}{2}(u+v+w)$

11. -70

12. $-\frac{2}{13}$

13. $\sqrt{3}x$

14. $(-2, 1 \pm \sqrt{3})$

15. 23.1

Solutions - Ind. Jan Reg. Pre-calc

- $m = -\frac{A}{B} = -\frac{3}{2}$; $\perp m = \frac{2}{3}$ $3x - 2y = -2$ [B]
- I, III, IV; $f(-x) = f(x)$ [A]
- $\cos(\alpha + \beta) = 2\cos^2\alpha - 1 = \cos 2\alpha$
 $\alpha + \beta = 2\alpha$ $x = \frac{\alpha + \beta}{2}$ [B]
- $a_n = a_1 r^{n-1}$ $a_n = 8(\frac{1}{2})^{n-1}$ $a_n = \frac{1}{2^{n-2}}$ [B]
- $\lim_{x \rightarrow 1} \frac{(x^2+1)(x+1)(x-1)}{(x-1)(x^2+x+1)} = \lim_{x \rightarrow 1} \frac{(x^2+1)(x+1)}{(x^2+x+1)} = \frac{4}{3}$ [C]
- $m = -\frac{2}{k} = -(\frac{8}{3}) = -\frac{8}{3}$ $-b = 8k$ $k = -3/4$ [D]
- $\frac{2x-5}{x-2} \leq 1$ $\frac{2x-5}{x-2} - 1 \leq 0$ $\frac{2x-5-(x-2)}{x-2} \leq 0$
 $\frac{x-3}{x-2} \leq 0$ $(2, 3]$ [D]
- $c^2 = a^2 + b^2 - 2ab \cos C$
 $c^2 = 260^2 + 134^2 - 2(260)(134)\cos 120^\circ$
 $c^2 = 120396$ $c = 347.0$ [C]

- $e = \frac{c}{a}$ $\frac{15}{10} = 1.5$ [A]
- $\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{3}{5} = \frac{3}{5}$ $\theta = \arccos(\frac{3}{5})$ [A]
- $x+y=2$ $F(-1, -1)$ [B]

- I, II, III Definition of continuous function [D]
- $(1-i)^{12}$ $r = \sqrt{2}$ $\theta = \tan^{-1}(-1) = \frac{3\pi}{4}$
 $(1-i)^{12} = (\sqrt{2})^{12} [\cos(12 \cdot \frac{3\pi}{4}) + i \sin(12 \cdot \frac{3\pi}{4})]$
 $= 64(-1+0) = -64$ [A]
- $f(x) = x^2 + 2x + 1$ $g(f(x)) = |x+1|$ [C]
- $\sin(C+A) = \sin C \cos A + \cos C \sin A$
 $= (\frac{4}{5})(\frac{12}{13}) + (\frac{3}{5})(\frac{5}{13}) = \frac{32}{65}$ [C]
- Domain $f(x) \geq x$ Domain $g(x) x \leq 1$
Domain $f(x) + g(x) = f \cap g$ $\therefore 0 \leq x \leq 1$ [C]

- $\frac{\sin 30^\circ}{20} = \frac{\sin 105^\circ}{x}$
 $x = 38.6$ [D]
- $\frac{y^2}{4} - \frac{(x-3)^2}{1} = 1$ asymptotes $y = \pm \frac{b}{a}x - \frac{3}{4}$
 $y = \pm \frac{2}{1}x - \frac{3}{4}$ [B]
- $u(0) = -5$ $v(-5) = 25$ $f(25) = \frac{1}{25}$ [B]
- $\begin{vmatrix} i & j & k \\ 4 & 3 & 4 \\ 5 & -2 & 8 \end{vmatrix} = 24i + 20j - 8k - 15k + 8i - 32j = 32i - 12j - 23k$ [D]

- $12x + 8y - 4z = 8$ $6x + 4y - 2z = 4$
 $12x - 4y - 3z = 38$ $6x + 11y - 3z = 24$
 $12x - z = -30$ $-11y + z = 29$
 $12y - z = -30$ $-24 - z = -30$
 $-11y + z = 28$ $z = 6$
 $3x - 4 - 6 = 2$ $19(4 + 2 + 6) = 152$
 $y = -2$ $z = 6$
 $x = 11$ [C]

- $2x + 4y = 6$ $2x - 5y = -1$ point of intersection $(1, 1)$. $m = \frac{4-1}{-6-1} = -\frac{3}{7}$
 $7y = 7$ $3x + 7y = 10$ [C]
- $\vec{AB} = i + j + 3k$ $\vec{AC} = i + 2j + 2k$ $A = \frac{1}{2} \begin{vmatrix} i & j & k \\ 1 & 1 & 3 \\ 1 & 2 & 2 \end{vmatrix} = \frac{1}{2} (2i + 3j + 2k - k - 6i - 2j) = -A = \frac{\sqrt{18}}{2} = \frac{3\sqrt{2}}{2}$ [C]
- $g(5) = 80$ $f(5) = 15$ $f(4) = 19$ $f(95) = 383$
 $g(19) = 1102$
 $g(f(4)) - f(g(5)) + f(5) = 1102 - 383 = 719$ [A]
- $r = \sin \theta$ $x^2 + y^2 - y = 0$ $C = (0, \frac{1}{2})$ [B]
- $\lim_{x \rightarrow 0} \frac{f(x) + g(x) - f(x)}{f(x)g(x)} = \frac{(4+16)}{(4)(16)} = \frac{1}{4}$ [C]
- $(y-k)^2 = 4p(x-h)$ $(y+3)^2 = 4(x-2)$ [C]
- $\log_a \frac{35}{6} = \log_a 35 - \log_a 6 = \log_a 7 + \log_a 5 - \log_a 2 - \log_a 3 = x + y - z$ [A]
- $\frac{1(1) + 1(0) + 1(0)}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ [C]
- [D] Ex. of a hyperbola.

- $A = -20 \cdot 48 = 28$ $B = \begin{vmatrix} i & j & k \\ -5 & 8 & -6 \\ 1 & 2 & 5 \end{vmatrix} = 58i - 29j - 12k$ $24i - 6j - 10k - 8k + 12i + 15j$
 $AB = 28(58i) = 1624$ $|36i + 9j - 18k| = 9\sqrt{21}$
- $4(x^2 + 6x + 9) + y^2 - 8y + 16 = -5 + 16 + 36$ $A = \pi ab$
 $\frac{(x+3)^2}{16} + (y-4)^2 = 1$ $A = (\frac{1}{2})(1)(\pi) = \frac{\pi}{2}$
- $A = 4(-2)^5 + 9(2)^4 - (-2)^3 + 2(-2)^2 + 3(-2) - 8 = 18$
 $B = f(-x) = x^4 + 5x^3 + 4x^2 - 3x - 24 = 1$ negative real root
 $C = 5 = -4$ $\frac{A}{a} + C = 18 + (-4) = 14$
- $A^2 = (20)^2 + (10)^2 - 2(20)(10)\cos 61.95^\circ$
 $A = 17.6$
 $B = \frac{17.6 \text{ miles}}{10 \text{ miles/hr}} = 1.76 \text{ hr}$
- $B - A = 105.6 - 17.6 = 88$
 $A = \frac{(b+c)^2}{4} = \frac{(4+6)^2}{4} = 25$

- $\sin(\frac{1}{\cos \alpha}) \frac{1}{\cos \beta} \cdot \frac{\cos \beta}{\sin \beta} \cdot \sin \beta \cdot \frac{\sin \beta}{\cos \beta}$
 $1 - \frac{1}{\cos \alpha} \cdot \frac{1}{\cos \beta} \cdot \sin \alpha \cdot \sin \beta = \frac{\sqrt{3}}{3}$
 $\frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta} = \frac{\sqrt{3}}{2}$
 $\tan(\alpha + \beta) = \frac{\sqrt{3}}{3}$
 $\alpha + \beta = \frac{\pi}{6}$

- $I_6 x = \sqrt{1 + \sqrt{3}x}$
 $x^2 = 1 + \sqrt{3}x$
 $x^2 - 1 = \sqrt{3}x$
 $x^4 - 2x^2 - x - 2 = 0$
 $x^4 - 2x^2 - x + 3 = 0$

Team Solutions cont. Jan. Reg.

8.
$$\begin{vmatrix} 2 & 5 & -1 & 2 & 5 \\ 5 & x & -4 & 5 & x \\ 1 & 9 & 7 & 1 & 9 \end{vmatrix} \begin{matrix} 14x - 20 - 45 + x + 72 - 175 = -123 \\ 15x - 168 = -123 \\ x = \boxed{3} \end{matrix}$$

9. $x = v_0 \cos \alpha t = 5m \quad t = \frac{5}{10 \cdot \frac{1}{2}} = \frac{1}{\sqrt{3}} \text{ sec.}$
 $y = v_0 \sin \alpha t - \frac{1}{2} g t^2 = (10 \cdot \frac{1}{2} \cdot \frac{1}{\sqrt{3}}) - (\frac{1}{2} \cdot 9.8 \cdot \frac{1}{3})$
 $= \boxed{11.25}$

10. $\vec{PQ} = \frac{\vec{w} + \vec{v}}{2}$ $\vec{AP} = \frac{1}{2}\vec{u}$ $\vec{AQ} = \vec{AP} + \vec{PQ}$
 $\vec{AQ} = \frac{1}{2}\vec{u} + \frac{\vec{w} + \vec{v}}{2} = \boxed{\frac{\vec{u} + \vec{v} + \vec{w}}{2}}$

11. $\frac{x-3}{2} = \frac{y+1}{5}$
 $5x - 15 = 2y + 2$
 $5x - 2y - 17 = 0 \quad m = \frac{5}{2} = A$

roots are 8, 1+i, 1-i

$S_1 = 10$

$S_2 = 8(1+i) + 8(1-i) + (1+i)(1-i)$

$S_3 = 18$

$x^3 - 10x^2 + 18x - 16 = 0$

$S_4 = 16$

$B = 1 + -10 + 18 + -16 = -7$

$C = 1$

$D = 4$

$ABCD = (\frac{5}{2})(-7)(1)(4) = \boxed{-70}$

12. $7x + 17 = 37 - 6x$

$13x = 20$

$x = \frac{20}{13}$

$\frac{4y+4}{6y+1} = 9$

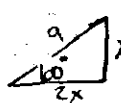
$4y+4 = 54y+9$

$-5 = 50y$

$-\frac{1}{10} = y$

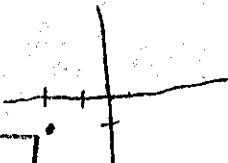
$xy = (\frac{20}{13})(-\frac{1}{10}) = \boxed{-\frac{2}{13}}$

13.



$a = \sqrt{b^2 + x^2}$

14. $\frac{(x+2)^2}{6} + \frac{(y+1)^2}{9} = 1$



$c^2 = a^2 - b^2$

$c^2 = 9 - 6$

$c = \sqrt{3}$

$F(-2, 1 \pm \sqrt{3})$

15. $A = \frac{1}{2} ab \sin C$

$A = \frac{1}{2} (6)(2)(7.5) \sin 97^\circ$

$A = \boxed{23.1}$