

MU ALPHA THETA  
PRE-CALCULUS ANSWERS

FEBRUARY

INDIVIDUAL

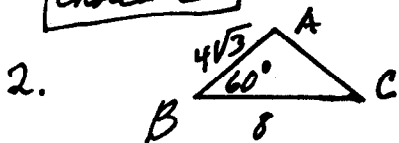
1. E
2. A
3. D
4. B
5. D
6. B
7. B
8. C
9. A
10. C
11. C
12. E
13. B
14. D
15. B
16. A
17. D
18. A
19. C
20. D
21. C
22. A
23. A
24. D
25. A
26. C
27. B
28. B
29. A
30. D

TEAM

1.  $\frac{\sqrt{2}}{2}$
2.  $3 - \sqrt{5} < X < 3 + \sqrt{5}$
3. 142
4.  $0^0, 90^0, 180^0, 270^0$
5. 18
6.  $(-4, 4)$  OR  $(2, -2)$
7. 36
8.  $14.5^0$
9.  $x^2 - 8x - 12y - 8 = 0$
10.  $\tan x$
11.  $3x + 2y = 5$
12.  $8i$
13. 2
14. 4
15.  $-5 < k < 0$

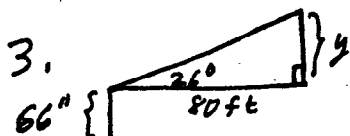
1.  $f(1) = 1+3 = 4$   
 $f(2) = 4+3 = 7$   
so "c" and "d" have more elements than the range values

Choice E



2. Area =  $\frac{1}{2} a c \sin B$   
 $= \frac{1}{2} (8) (4\sqrt{3}) (\sin 60^\circ)$   
 $= 24 \text{ sq. units}$

Choice A



3.  $\tan 26^\circ = \frac{y}{80 \text{ ft}}$   
 $y = (80 \text{ ft}) \left( \frac{12 \text{ in}}{\text{ft}} \right) \tan 26^\circ$   
 $= 468.223285 \dots$

so HEIGHT =  $468 + 66 = 534 \text{ in.}$

Choice D

4.  $(4 \text{ cis } 217^\circ) (7 \text{ cis } 98^\circ) \left( \frac{1}{2} \text{ cis } 53^\circ \right)$   
 $14 \text{ cis } 368^\circ = 14 \text{ cis } 8^\circ$

Choice B

5.  $4(x^2 - 6x + 9) + 9(y^2 + 4y + 4) = 0 + 36 + 36$   
 $4(x-3)^2 + 9(y+2)^2 = 72$   
Center at  $(3, -2)$

Choice D

6.  $3 + 7 + 11 + \dots + 79 = A$   
 $2 + 6 + 10 + \dots + 78 + 82 = B$   
 $B - A = -1(80) + 82 = 62$

Choice B

7.  $\vec{c} = 2 \langle -2, 5, -1 \rangle - \langle 3, -4, 2 \rangle$   
 $= \langle -4, 10, -2 \rangle + \langle -3, 4, -2 \rangle$   
 $\vec{c} = \langle -7, 14, -4 \rangle$

Choice B

8.  $2 \sin^2 x + \sin x - 1 = 0$   
 $(2 \sin x - 1)(\sin x + 1) = 0$   
 $\sin x = \frac{1}{2} \quad | \quad \sin x = -1$   
 $30^\circ, 150^\circ \quad | \quad 270^\circ$

Choice C

9.  $-3 \leq 3 \sin x \leq 3$   
 $-5 \leq 3 \sin x - 2 \leq 1$   
 $0 \leq |3 \sin x - 2| \leq 5$   
 $5 \leq |3 \sin x - 2| + 5 \leq 10$   
no max. value is 10

Choice a

10.  $2x^5 + x^4 - 10x^3 - 5x^2 + 6x + 4 = 0$   
 $x^4(2x+1) - 5x^2(2x+1) + 4(2x+1) = 0$   
 $(2x+1)(x^4 - 5x^2 + 4) = 0$   
 $(2x+1)(x^2 - 4)(x^2 - 1) = 0$   
 $(2x+1)(x+2)(x-2)(x+1)(x-1) = 0$   
 $-\frac{1}{2} \quad -2 \quad 2 \quad -1 \quad 1$

Choice C

11.  $(\tan y - 1)^2 = 0$  OR  $\cos y - \sin y = 0$   
 $\tan y = 1$  OR  $\cos y = \sin y$   
 $y = 45^\circ, 225^\circ$  |  $y = 45^\circ, 225^\circ$

Choice C

12. ADD 2 sq. you get  $5x + y = 28$

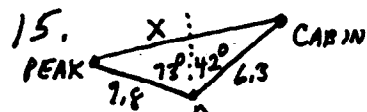
Choice E

13.  $\ln e^{3x+2} - \log_8 8^{4-x} + \ln e^{2x}$   
 $3x+2 - (4-x) + 2x+7$   
 $6x+5$

Choice B

14.  $f(9) = f(7) + 81 = 66 + 81 = 147$   
 $f(7) = f(5) + 49 = 17 + 49 = 66$   
 $f(5) = f(3) + 25 = -8 + 25 = 17$

Choice D



15.  $x^2 = 9.8^2 + 6.3^2 - 2(9.8)(6.3) \cos 42^\circ$   
 $x = 13.708$

Choice B

16.  $\log_6(x^2 + 5x) = 2$   
 $x^2 + 5x = 36 \quad (6^2)$   
 $x^2 + 5x - 36 = 0$   
 $(x+9)(x-4) = 0$   
 $x = -9 \quad x = 4$  Both check

Choice A

17.  $(x-3)^2 = 16(y-1)$

Choice D

18.  $\frac{\sin^3 x - \cos^3 x}{\sin x - \cos x}$   
 $(\sin x - \cos x)(\sin^2 x + \sin x \cos x + \cos^2 x)$   
 $-\sin x - \cos x$

$1 + \sin x \cos x$  or  $1 + \frac{1}{2} \sin 2x$

Choice A

19.  $(2x-3) + (3x-3) + (4x-3) = 27$   
 $9x - 9 = 27$   
 $9x = 36$   
 $x = 4$

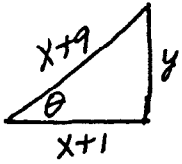
Choice C

ANSWER KEY

INDIVIDUAL

TEAM

20.



$$\sin \theta = \frac{y}{x+9}$$

$$y^2 + (x+1)^2 = (x+9)^2$$

$$y^2 = x^2 + 18x + 81 - x^2 - 2x - 1$$

$$y^2 = 16x + 80$$

$$y = \sqrt{16x+80} = 4\sqrt{x+5}$$

$$\text{so } \sin \theta = \frac{4\sqrt{x+5}}{x+9}$$

Choice D

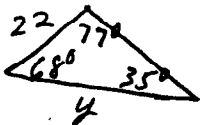
21.  $\left(\frac{1}{2}\right)^2 - \left(-\frac{1}{2}\right)^3$

$$\frac{1}{8} (1)$$

$$\frac{\frac{1}{4} - \frac{-1}{8}}{\frac{1}{8}} = \frac{\frac{3}{8}}{\frac{1}{8}} = 3$$

Choice C

22.



$$\frac{y}{\sin 77} = \frac{22}{\sin 35}$$

$$y = \frac{22 \sin 77}{\sin 35} = 37.373$$

Choice A

23. The DOT Product of Choice A with 2 vectors give Zero so

Choice A

24.

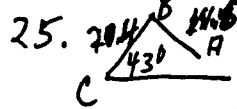
$$x^2 + 5 - (2x + 3) = -3$$

$$x^2 - 2x + 2 = -3$$

$$x^2 - 2x + 5 = 0$$

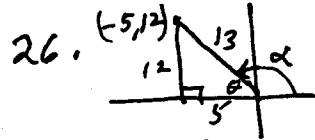
$$x = \frac{2 \pm \sqrt{4 - 20}}{2} = \frac{2 \pm 4i}{2}$$

Choice D



$\sin 21.4 \sin 43 = 14.5847$   
and  $14.6 > 21.4 \sin 43$   
2  $\Delta$ s are possible

Choice A



$$\tan \theta = \frac{12}{5} =$$

$$\theta = 67.38$$

$$\text{so } \alpha = 112.62$$

Choice C

27.  $a_{16} = (17+29x) + 15(-2-3x)$

$$= 17 + 29x - 30 - 45x$$

$$= -13 - 16x$$

Choice B

28.  $\frac{1}{2} \sin 2x + \cos^2 x = 0$

$$\sin x \cos x + \cos^2 x = 0$$

$$\cos x (\sin x + \cos x) = 0$$

$$\cos x = 0 \quad \sin x + \cos x = 0$$

$$90^\circ, 270^\circ \quad \sin x = -\cos x$$

$$135^\circ, 315^\circ$$

Choice B

29.  $S = \frac{4}{1 - \frac{1}{2}} = 8$

$$T = \frac{9}{1 - \frac{1}{3}} = \frac{27}{2}$$

$$S - T = \frac{16}{2} - \frac{27}{2} = -\frac{11}{2}$$

Choice A

30. a)  $\cos x \left(\frac{\cos x}{\sin x}\right) \left(\frac{1}{\cos x}\right) = \cot x$

b)  $\cos^2 x + 2 \sin x \cos x + \sin^2 x - 1 = \sin 2x$

c)  $\sin x \frac{\cos x}{\sin x} = \cos x$

d)  $\cos x \left(\frac{\sin x}{\cos x}\right) = \sin x$

Choice D

①

$$\sin 45^\circ + \cos 60^\circ = \frac{\sqrt{2}}{2} + \frac{1}{2} = A$$

$$B = \sin 90^\circ = 1$$

$$2x^2 + 5x - 3 = 0 \quad C = \frac{1}{2}$$

$$(2x-1)(x+3) = 0$$

$$x = \frac{1}{2} \quad x = -3$$

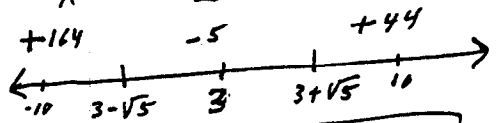
$$\left(\frac{\sqrt{2}}{2} + \frac{1}{2}\right) - 1 + \frac{1}{2} = \frac{\sqrt{2}}{2}$$

②

$$x^2 - 6x + 4 < 0$$

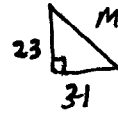
$$\text{Solve } x^2 - 6x + 4 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 16}}{2} = \frac{6 \pm 2\sqrt{5}}{2} = 3 \pm \sqrt{5}$$



$$\text{so } 3 - \sqrt{5} < x < 3 + \sqrt{5}$$

③

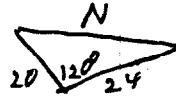


$$M^2 = 23^2 + 21^2 = 1490$$

Use Heron's Formula for P

$$P = \sqrt{9(6)(2)(1)} = \sqrt{108}$$

$$P^2 = 108$$



$$N^2 = 20^2 + 24^2 - 2(20)(24)\cos 120 = 1456$$

$$\text{so } M^2 - N^2 + P^2 = 142$$

④

using Quadratic formula

$$x = \frac{\sin a \pm \sqrt{\sin^2 a + \cos^2 a}}{2} = \frac{\sin a \pm 1}{2}$$

$$\text{so } \frac{\sin a \pm 1}{2} = 0 \quad \frac{\sin a \pm 1}{2} = \frac{1}{2}$$

$$\sin a = \pm 1$$

$$\sin a = 1 \quad \sin a = -1$$

$$\sin a = 0 \quad \sin a = 0$$

$$a = 270^\circ, 90^\circ$$

$$a = 0^\circ, 180^\circ$$

answer  $0^\circ, 90^\circ, 180^\circ, 270^\circ$

⑤

$$x^2 + 6x + 9 - (y^2 - 8y + 16) = 11 + 9 - 16$$

$$(x+3)^2 - (y-4)^2 = 4 \quad A(-3, 4)$$

$$6x + y = 8 \rightarrow B(0, 8)$$

$$AB = 5, AD = 5$$

$$OB = 8$$

$$\text{Perimeter} = 18$$

