ANSWERS TO PRE CALCULUS INDIVIDUAL

1. A
2. D
3. C
4. C
5. D
6. C
7. B
8. D
9. C
10. E (3/4)
11. D
12. B
13. B
14. A
15. E (All Real Numbers except 0)
16. D
17. B
18. B
19. D
20. B
21. C
22. D
23. D
24. D
25. E (6)
26. A
27. C
28. B
29. D
30. D

ANSWERS TO PRE CALCULUS TEAM

1. $\frac{\sqrt{3} + \sqrt{6}}{2}$
2. $\frac{-40}{3}$
3. 3360
4. $\frac{34}{5}$ or 6.8
5. 1180
6. ln 5
7. $\frac{\pi}{6}$
8. 14
9. $\frac{2133}{3125}$
10. $\frac{2}{\cos A}$
11. $\sqrt{51}$
12. 720
13. 53
14. 8i + 8j - 4k
15. xy = -4

27. C

$$\frac{4x+3y+6}{\sqrt{4^2+3^2}} = \pm \frac{6x-8y+7}{\sqrt{6^2+8^2}}$$

$$8x+6y+12 = \pm(6x-8y+7)$$

$$2x+14y=-5, \quad 14x-2y=-19$$

28. B

$$X=\sqrt{42+\sqrt{42+\sqrt{42}}}\ldots$$

$$X=\sqrt{42+X} \qquad X=7,-6$$

$$X^2=42+X \qquad X=7$$

29. D

$$140=2^2\cdot 5\cdot 7$$

$$s(d)=(1+2+2^2)(1+5)(1+7)$$

$$=7\cdot 6\cdot 8$$

$$=336$$

30. D

$$\frac{1}{n}+\frac{2}{n}+\frac{3}{n}\ldots\frac{n-1}{n}=1999$$

$$\frac{1+2+3\ldots(n-1)}{n}=1999$$

$$\left(\frac{n-1}{2}\right)(n-1+1)=1999n$$

$$(n-1)(n)=3998n$$

$$n-1=3998$$

$$n=3999$$

Team Round

Pre-Cal.

1. $\cos 30^\circ+\cos 45^\circ+2\cos 75^\circ$

$$\frac{\sqrt{3}}{2}+\frac{\sqrt{2}}{2}+2\cos(30^\circ+45^\circ)$$

$$\frac{\sqrt{3}}{2}+\frac{\sqrt{2}}{2}+2\left[\cos 30^\circ\cos 45^\circ-\sin 30^\circ\sin 45^\circ\right]$$

$$\frac{\sqrt{3}+\sqrt{2}}{2}+2\left(\frac{\sqrt{3}}{2}\cdot\frac{\sqrt{2}}{2}-\frac{1}{2}\cdot\frac{\sqrt{2}}{2}\right)$$

$$\frac{\sqrt{3}+\sqrt{2}}{2}+\frac{\sqrt{6}-\sqrt{2}}{2}=\boxed{\frac{\sqrt{6}+\sqrt{3}}{2}}$$

2. $(x,5)\quad 3x+4y=0$

$$4=\left|\frac{3x+4(5)+0}{\sqrt{3^2+4^2}}\right| \qquad 4=\pm\frac{3x+20}{5}$$

$$20=\pm 3x+20$$

$$20=3x+20 \qquad 20=-3x-20$$

$$x=0 \qquad x=-\frac{40}{3}$$

$$0+\frac{-40}{3}=\boxed{\frac{-40}{3}}$$

3. $${}_{10}C_6\,(2x)^4\left(\frac{-1}{\sqrt{x}}\right)^6$$

$$\frac{10\cdot 9\cdot 8\cdot 7}{4\cdot 3\cdot 2}\left(16x^8\right)\left(\frac{1}{x^3}\right)=210(16)(x^5)$$

$$=3360x^5$$

$$\boxed{3360}$$

4. $(-2,12)$ is center of circle $r=4$

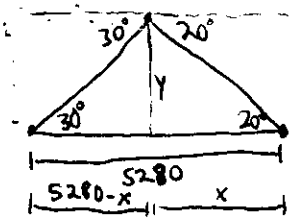
$$d=\left|\frac{4(-2)-3(12)-10}{\sqrt{4^2+32}}\right|$$

$$d=\frac{54}{5} \qquad d-r=x$$

$$\frac{54}{5}-4=x$$

$$x=\boxed{\frac{34}{5}\text{ or }6.8}$$

7.



$(5280-x)\tan 30° = x\tan 20°$

$x \approx 3238.4$

$y = x\tan 20°$

$\boxed{y \approx 1180 \text{ ft}}$

8. Point B must be on the line that contains pts. $(1,5)$ and $(-5,2)$ to ensure that it is not on circle A.

$m = \frac{5-2}{1-5} = \frac{3}{6} = \frac{1}{2}$

$y - 5 = \frac{1}{2}(x-1)$

$y = \frac{1}{2}x + 4\frac{1}{2}$

$y = \frac{1}{2}(19) + 4\frac{1}{2}$

$\boxed{y = 14}$

$e^x - 20e^{-x} = 1$

$\frac{(e^x)^2 - 20}{e^x} = 1$

$(e^x)^2 - e^x - 20 = 0$

$(e^x - 5)(e^x + 4) = 0$

$e^x = 5 \quad e^x = -4$

$x = \ln 5 \quad x = \cancel{\ln -4}$

$\boxed{\ln 5}$

9. $(\frac{3}{5})$ - winning

$(\frac{2}{5})$ - losing

${}_5C_2\,(\frac{3}{5})^3(\frac{2}{5})^2 = 10\cdot\frac{3^3\cdot 2^2}{5^5}$

${}_5C_1\,(\frac{3}{5})^4(\frac{2}{5})^1 = 5\cdot\frac{3^4\cdot 2}{5^5}$

${}_5C_0\,(\frac{3}{5})^5(\frac{2}{5})^0 = 1\cdot\frac{3^5}{5^5}$

$\frac{10\cdot 27\cdot 4}{5^5} + \frac{5\cdot 81\cdot 2}{5^5} + \frac{243}{5^5} = \boxed{\frac{2133}{3125}}$

$\frac{e^{ix} - \frac{\sqrt{3}}{2}}{i} = \frac{1}{2}$

$e^{ix} = \frac{\sqrt{3}}{2} + \frac{1}{2}i$

$e^{ix} = \cos\frac{\pi}{6} + i\cdot\sin\frac{\pi}{6}$

using: $e^{ix} = \text{cis}\,x$

$\boxed{x = \frac{\pi}{6}}$

10. $\left(\frac{1+\sin A}{\cos A} + \frac{\cos A}{1+\sin A}\right)(1+\sin A)(\cos A)$

$\frac{(1+\sin A)^2 + \cos^2 A}{\cos A(1+\sin A)}$

$\frac{1 + 2\sin A + \sin^2 A + \cos^2 A}{\cos A(1+\sin A)}$

$\frac{2 + 2\sin A}{\cos A(1+\sin A)} \qquad \frac{2(\cancel{1+\sin A})}{\cos A(\cancel{1+\sin A})}$

$\boxed{\frac{2}{\cos A}}$

11. cylindrical → car

$(5\sqrt{2}, 45°, 10) \rightarrow (5, 5, 10)$

$(4, 90°, 5) \rightarrow (0, 4, 5)$

$$d = \sqrt{(5-0)^2 + (5-4)^2 + (10-5)^2}$$

$$\boxed{d = \sqrt{51}}$$

12. $v = \omega \cdot r$

$$45 \tfrac{\text{miles}}{\text{hour}} = \omega\left(\tfrac{21}{2} \text{ in.}\right)$$

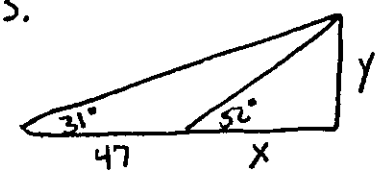
$$= \frac{45 \text{ miles}}{\text{hour}} \left| \frac{5280 \text{ ft}}{1 \text{ mile}} \right| \frac{12 \text{ in}}{1 \text{ ft}} \left| \frac{2}{21} \right.$$

$$\approx 271,542.857$$

$$\frac{271,542.857 \text{ radian}}{1 \text{ hour}} \left| \frac{1 \text{ hour}}{60 \text{ minutes}} \right| \frac{1 \text{ rev.}}{2\pi \text{ radians}}$$

$$\approx \boxed{720}$$

13.



$y = (47+x)\tan 31°$

$y = (x)\tan 52°$

$(47+x)\tan 31° = (x)\tan 52°$

$x \approx 41.586$

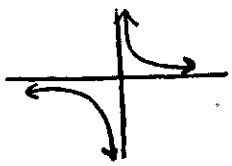
$\tan 52° = \frac{y}{x} = \frac{y}{41.586}$

$$\boxed{y \approx 53m}$$

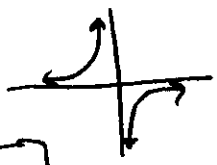
14. $2i + 2j - k$ magnitude = 3

$$12\left(\frac{2i+2j-k}{3}\right) = \boxed{8i + 8j - 4k}$$

15. $xy = 4$



rotate 90° ↰



$$\boxed{xy = -4}$$