1. $\cot 2\theta = \frac{24-4}{5} = 4 \quad \theta \approx .122$ (C)

2. A → Period = LCM $\left(\frac{2\pi}{|6|}, \frac{2\pi}{|-6|}\right)$
$= \frac{\pi}{3}$

B → Amplitude = $\sqrt{10^2+24^2}$
$= 26$

$A\pi^{-1} + B = 79/3$ (B)

3. $\cos\theta = \frac{a\cdot v}{|a||v|} = \frac{17\sqrt{26}}{130} \Rightarrow 173$ (C)

4. row 3 = 2 × row 2 → determinant = 0, (E)

5. $\frac{123\pi}{456} + 2\pi(-2) = -\frac{567\pi}{152}$ (B)

6. $r = 13\sqrt{2}, \ \theta = 315°$
$(-13\sqrt{2}, 495°)$ (C)

7. $R = \frac{abc}{4(\text{area of }\triangle)} = \frac{7(5)(8)}{4\cdot 10\sqrt{3}}$
$= \frac{7\sqrt{3}}{3}$ Area of $\odot = \frac{49\pi}{3}$ (A)

8. $80 \text{ rpm} = 80\left(\frac{2\pi}{60}\right) \text{ rad/sec} = \frac{8\pi}{3}$ rad/sec. Then in 1 sec wheel turns an $\angle$ of $\frac{8\pi}{3}$ R and point on rim travels $s = r\theta = 2\cdot\frac{8\pi}{3} = 16.8$ (C)

9. Area = $\frac{1}{2}$(apothem)(perimeter)
14.485 96
$= 695$ (C)

10. 1st statement true → 5 (E)

Arcsin x + Arccos x = $\frac{\pi}{2}$

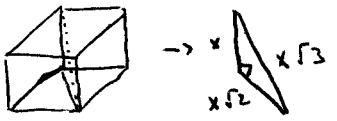
(3,4) is not on unit circle

Phase shift is −2

(sum = 5 → (E))

11. $6 + 6\sqrt{3}i = 12\,\text{cis}\,\pi/6$
$(12\,\text{cis}\,\pi/6)^6 = 12^6\,\text{cis}\,\pi$
-2985984 (D)

12. $\cosh^2 x - \sinh^2 x = 1$ (B)

13.


$\sin\theta = \frac{x\sqrt{2}}{x\sqrt{3}} \rightarrow \theta = 54.7°$ (B)

14. Use sine sum formula for
$\sin(135° + 30°) \rightarrow$
$\frac{1}{4}(\sqrt{6} - \sqrt{2}) \rightarrow 48$ (D)

15. Range of Arccscx $[-\pi/2, \pi/2]$
not incl. 0
cscθ negative from $(-\pi, 0)$
intersection = $[-\pi/2, 0)$ (C)

16. $r = a\cos n\theta$ or $a\sin n\theta$
if n even, petal # = 2n
→ 8 (D)

17. $\sin\theta = \frac{|\vec{AB} \times \vec{AC}|}{|\vec{AB}|\,|\vec{AC}|}$
$= .605$ (B)

18. $\left[\frac{\sin^2 x}{\cos^2 x} - \frac{2\sin^2 x}{\cos x} = 0\right]\frac{\cos^2 x}{\sin^2 x}$

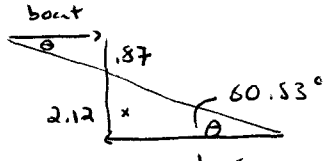
$\sin^2 x = 0$ $\quad 1 - 2\cos x = 0$
$x = \pi, 2\pi$ $\quad \cos x = \frac{1}{2}$
$x = \pi/3, 5\pi/3$

product = $\frac{10}{9}\pi^4$ (C)

19. Only third is true III (A)
$\sin(90 - \theta) = \cos\theta$
imaginary axis is horizontal

20. Can be evaluated by estimation w/ very small values of x
$\lim_{x\to 0} \frac{\sin x}{x} = 1$ (B)

21. $\frac{\cos^2\theta + (1+\sin\theta)^2}{\cos\theta(1+\sin\theta)}$
$= \frac{2+2\sin\theta}{\cos\theta(1+\sin\theta)} = \frac{2}{\cos\theta}$
$= 2\sec\theta$ (A)

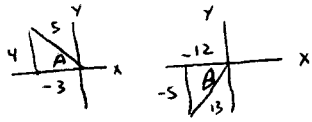
22.


→ dist = $\frac{1}{60}(72)$
$= 1.2$

$\tan 60.53° = \frac{x}{1.2} \quad x = 2.12$

$= \frac{.87}{\text{dist}} \quad \text{dist} = .495$

.495 = rate $\left(\frac{1}{60}\right)$
→ = 29.715 mph (C)

23.


$\frac{\tan A - \tan B}{1 + \tan A \tan B} \Rightarrow -\frac{63}{16}$ (A)

24. $r = \frac{k}{a + b\cos\theta}$
eccentricity = $\left|\frac{b}{a}\right| = \frac{3}{2}$ (E)

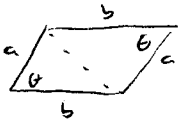
25. $\left|\frac{11}{2}(36) - 30(6)\right| = 18°$
$\sin 18° = \frac{\sqrt{5}-1}{4}$ 10 → (A)

26. $\{1, 6, 6, 0, 720\}$
mode = 6 → (C)

27. $\tan\theta = \frac{m_1 - m_2}{1 + m_1 m_2} \quad \frac{11}{29}$ (B)

28. dot product = 0 =
$3J + 12 - 45 \quad J = 1$ (

29. $\sin x$ → no $\quad \sec x$, yes
$|x|$ → yes $\quad x^2+1$, yes
$32x^4$ → yes $\quad x^2 + y^2 = 36$
4 → (B) not function

30.


$2\left(\frac{1}{2}ab\sin\theta\right)$
$ab\sin\theta$ (B)