Alpha – Polar Topic Test Solutions: National Mu Alpha THeta Convention 2012

1. B
   - The other three are all in the 4th quadrant.

2. C
   – Reference angles are the positive acute angle between a terminal side and the x-axis.
3. A
4. B
5. B

$$R= \sqrt{15^2+20^2} = 25 ; \theta = \arctan(\frac{opp}{adj})$$

6. E $(-\sqrt{6}-\sqrt{2}, -\sqrt{6}+\sqrt{2})$

$4\cos(15) = 4\cos(45-30) = 4[\cos 45\cos 30 + \sin 45\sin 30] = 4\left[\frac{\sqrt{6}+\sqrt{2}}{4}\right] = -\left(\sqrt{6}+\sqrt{2}\right)$ negative x direction

$4\sin(15) = 4\sin(45-30) = 4[\sin 45\cos 30 - \cos 45\sin 30] = 4\left[\frac{\sqrt{6}-\sqrt{2}}{4}\right] = -\left(\sqrt{6}-\sqrt{2}\right)$ negative y direction

7. B

a. $\theta = \frac{-5\pi}{12}$ =line at -75 degrees

b. $\theta = \frac{-7\pi}{12}$ =line at -105 degrees (75 degrees)**greatest positive slope

c. $\theta = \frac{\pi}{12}$ =line at 15 degrees

d. $\theta = \frac{-13\pi}{12}$ =line at 165 degrees

e. None of the Above

8. D
   a. $r = 4; d = 8; C = 8\pi$
   b. $r = -8/3; d = \frac{16}{3}; C = \frac{16}{3}\pi$
   c. $r = 8\cos\theta; d = 8; C = 8\pi$
   d. $r = -10\sin\theta; d = 10; C = 10\pi$
   e. None of the Above

9. E

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$r = \frac{8}{2-4\cos\theta} = \frac{4}{1-2\cos\theta} = \frac{ep}{1-e\cos\theta}; e = 2; p = 2$, so the directrix would be at x = -2, which is not listed.

10. A
11. E
12. C $\left(3-3i\sqrt{3}\right)(-4-4i) = \left(6cis-60^\circ\right)\left(4\sqrt{2}cis225^\circ\right) = 24\sqrt{2}cis165^\circ$

13. A $(1-i)^{2012} = \left(\sqrt{2}cis-\frac{\pi}{4}\right)^{2012} = 2^{1006}\left[cis\frac{-2012}{4}\right] = -2^{1006}$

14. B
15. B
16. D
17. B x = 0 is a vertical line with undefined slope

18. B Find the intersection points:

$$0 = 4\cos(3\theta)$$
$$0 = \cos(3\theta)$$
$$3\theta = \frac{\pi}{2}, 3\frac{\pi}{2}$$

19. D
$$(r\sin\theta)^2 = 3r\cos\theta$$
$$r = \frac{3\cos\theta}{\sin^2\theta} = 3\frac{\cos\theta}{\sin\theta}\frac{1}{\sin\theta}$$

20. A
$$r\left(r = \sin\theta\right)$$
$$r^2 = r\sin\theta$$
$$x^2 + y^2 = y$$

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21. A

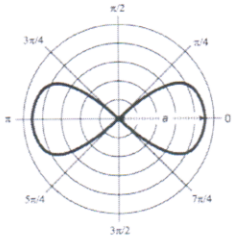
$$1+\cos\theta = 1-\cos\theta$$
$$2\cos\theta = 0$$
$$\cos\theta = 0$$
$$\theta = \frac{\pi}{2} + \pi k$$

22. A

23. E = Not a possible triangle because two of the vertices are on coterminal angles.

24. B = they both have reference angles of 60 degrees.

25. A lemniscate:



a.

26. A

$$(2-2i)^7(1+i)^6$$

27. A

$$\left(\sqrt{8}cis-45\right)^7\left(\sqrt{2}cis45\right)^6$$
$$\left(2^{\frac{21}{2}}cis-315\right)\left(2^3cis270\right)=2^{\frac{27}{2}}cis-45$$

28. E radius of 0 would be the minimum.

29. B

30. A