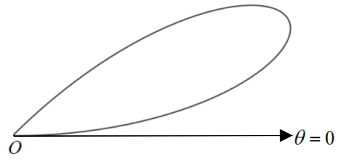
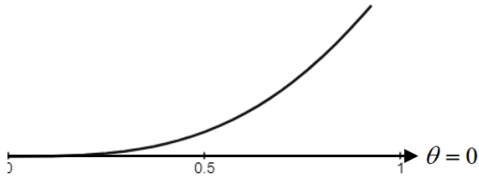
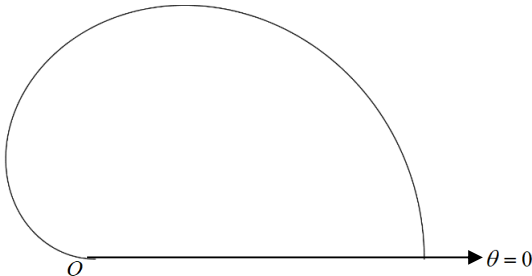
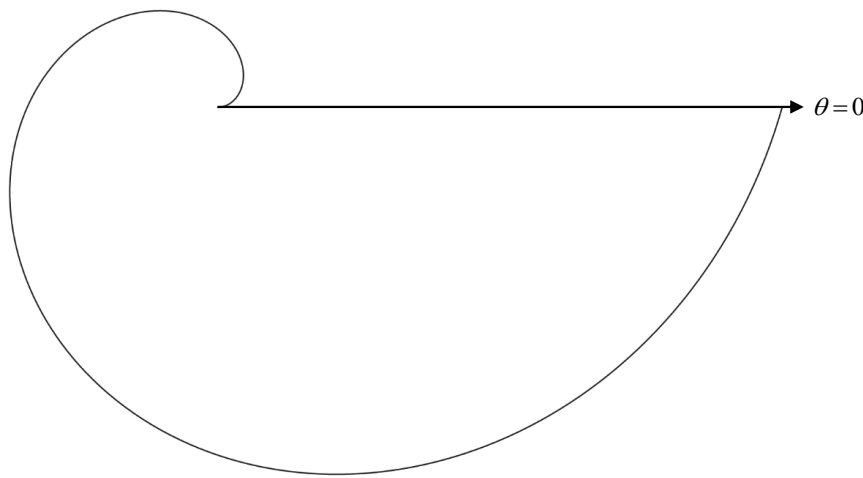


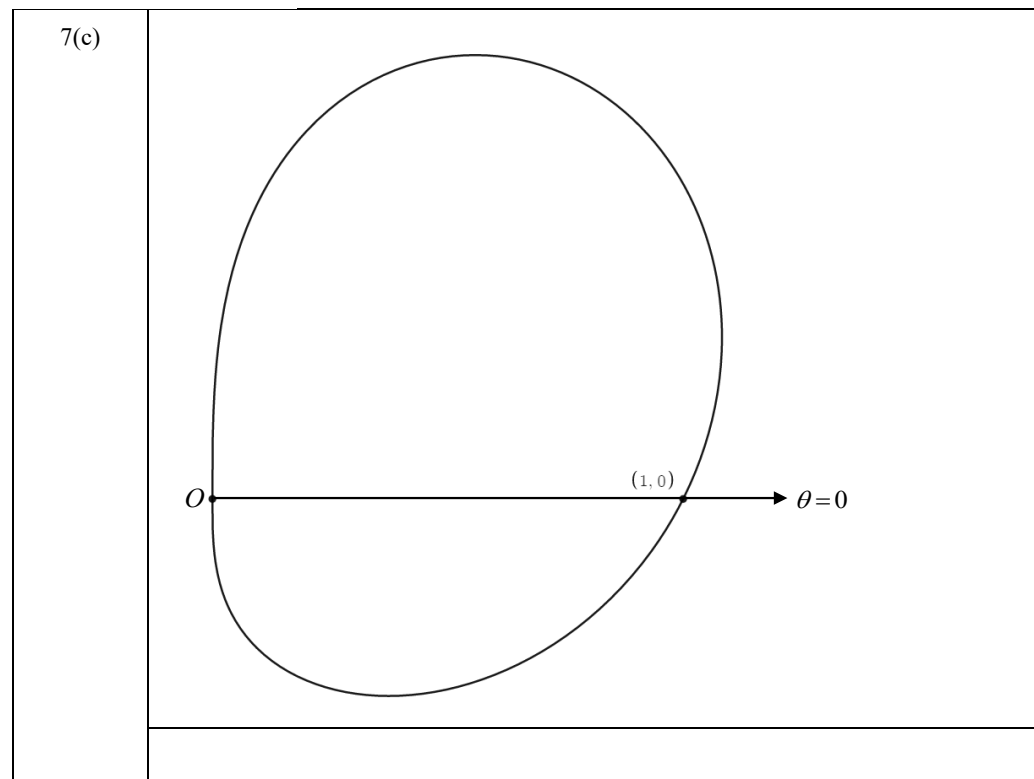
6(a)	
	$\theta = \frac{1}{6}\pi.$
6(b)	$\frac{1}{2} \int_0^{\frac{1}{2}\pi} \sin^2 3\theta \, d\theta$
	$= \frac{1}{4} \int_0^{\frac{1}{2}\pi} 1 - \cos 6\theta \, d\theta = \frac{1}{4} \left[\theta - \frac{1}{6} \sin 6\theta \right]_0^{\frac{1}{2}\pi}$
	$= \frac{1}{12} \pi$
6(c)	$y = 3\sin^2 \theta - 4\sin^4 \theta$
	$6\sin \theta \cos \theta - 16\sin^3 \theta \cos \theta = 0$
	$\sin \theta \cos \theta \neq 0 \Rightarrow 6 - 16\sin^2 \theta = 0$
	$\sin^2 \theta = \frac{3}{8}$
	$y = \frac{9}{16}.$
6(d)	$r^4 = r \sin \theta (3r^2 - 4r^2 \sin^2 \theta)$
	$r = \frac{3y}{r} - 4 \frac{y^3}{r^3}$
	$(x^2 + y^2)^2 = y(3x^2 - y^2)$

5(a)	
	Maximum distance of C from the pole is 1.
5(b)	$\frac{1}{2} \int_0^{\frac{1}{2}\pi} \tan 2\theta \, d\theta$
	$= \frac{1}{2} \int_0^{\frac{1}{2}\pi} \frac{\sin 2\theta}{\cos 2\theta} \, d\theta = -\frac{1}{4} [\ln \cos 2\theta]_0^{\frac{1}{2}\pi}$
	$= -\frac{1}{4} \ln \frac{\sqrt{2}}{2} = \frac{1}{8} \ln 2$
5(c)	$r^2 = \frac{2 \tan \theta}{1 - \tan^2 \theta}$
	$x^2 + y^2 = \frac{2\left(\frac{y}{x}\right)}{1 - \frac{y^2}{x^2}} = \frac{2xy}{x^2 - y^2}$
	$(x^2 + y^2)(x^2 - y^2) = 2xy$
	$x^4 - y^4 = 2xy$
5(d)	$\frac{1}{2} \left(\cos \frac{1}{8}\pi \right) \left(\sin \frac{1}{8}\pi \right) - \frac{1}{8} \ln 2$
	$\frac{1}{8} \sqrt{2} - \frac{1}{8} \ln 2$

6(a)	
6(b)	$\frac{1}{2} \int_0^{\pi} \cos^2 \frac{1}{2} \theta \, d\theta$ $= \frac{1}{4} \int_0^{\pi} \cos \theta + 1 \, d\theta = \frac{1}{4} [\sin \theta + \theta]_0^{\pi}$ $= \frac{1}{4} \pi$
6(c)	$y = \cos \frac{1}{2} \theta \sin \theta$ $\cos \frac{1}{2} \theta \cos \theta - \frac{1}{2} \sin \theta \sin \frac{1}{2} \theta = 0$ $\cos \frac{1}{2} \theta (2 \cos^2 \frac{1}{2} \theta - 1) - \sin^2 \frac{1}{2} \theta \cos \frac{1}{2} \theta = 0$ $\cos \frac{1}{2} \theta \neq 0 \Rightarrow 2 \cos^2 \frac{1}{2} \theta - 1 - \sin^2 \frac{1}{2} \theta = 0$ $2 \cos^2 \frac{1}{2} \theta - 1 - (1 - \cos^2 \frac{1}{2} \theta) = 0 \Rightarrow 3 \cos^2 \frac{1}{2} \theta - 2 = 0$ $\cos^2 \frac{1}{2} \theta = \frac{2}{3}$ $y = 2 \cos^2 \frac{1}{2} \theta \sin \frac{1}{2} \theta = 2 \left(\frac{2}{3} \right) \sqrt{1 - \frac{2}{3}} = \frac{4}{3} \sqrt{\frac{1}{3}}$

5(a)	
5(b)	$\frac{1}{2} \int_0^{2\pi} \theta^2 e^{\frac{1}{4}\theta} \, d\theta$ $= \frac{1}{2} \left[4\theta^2 e^{\frac{1}{4}\theta} \right]_0^{2\pi} - \frac{1}{2} \int_0^{2\pi} 8\theta e^{\frac{1}{4}\theta} \, d\theta$ $= \frac{1}{2} \left[4\theta^2 e^{\frac{1}{4}\theta} \right]_0^{2\pi} - 4 \left[4\theta e^{\frac{1}{4}\theta} \right]_0^{2\pi} + 16 \int_0^{2\pi} e^{\frac{1}{4}\theta} \, d\theta = \left[2\theta^2 e^{\frac{1}{4}\theta} - 16\theta e^{\frac{1}{4}\theta} + 64e^{\frac{1}{4}\theta} \right]_0^{2\pi}$ $= (8\pi^2 - 32\pi + 64)e^{\frac{1}{2}\pi} - 64$
5(c)	$y = \theta e^{\frac{1}{8}\theta} \sin \theta$ $\frac{dy}{d\theta} = \theta e^{\frac{1}{8}\theta} \cos \theta + \sin \theta \left(\frac{1}{8} \theta e^{\frac{1}{8}\theta} + e^{\frac{1}{8}\theta} \right)$ $e^{\frac{1}{8}\theta} \neq 0 \Rightarrow \theta \cos \theta + \left(\frac{1}{8} \theta + 1 \right) \sin \theta = 0$ $5 \cos 5 + \left(\frac{5}{8} + 1 \right) \sin 5 = -0.1399$ $\text{and } 5.05 \cos 5.05 + \left(\frac{5.05}{8} + 1 \right) \sin 5.05 = 0.1336$

7(a)	$-\mathrm{e}^{\sin \theta} \sin \theta + \mathrm{e}^{\sin \theta} \cos^2 \theta = 0$
	$\cos^2 \theta - \sin \theta = 0$
	$1 - \sin^2 \theta - \sin \theta = 0$
	$\sin \theta = \frac{1}{2}(-1 + \sqrt{5})$
	$(1.208, 0.666)$
7(b)	$x = \mathrm{e}^{\frac{1}{2} \sin \theta} \cos^{\frac{3}{2}} \theta$ $\frac{\mathrm{d}x}{\mathrm{d}\theta} = -\frac{3}{2} \mathrm{e}^{\frac{1}{2} \sin \theta} \cos^{\frac{1}{2}} \theta \sin \theta + \frac{1}{2} \cos^{\frac{5}{2}} \theta \mathrm{e}^{\frac{1}{2} \sin \theta} = 0$
	$-3 \sin \theta + \cos^2 \theta = 0$
	$-3 \sin \theta + 1 - \sin^2 \theta = 0$
	$\sin \theta = \frac{1}{2}(-3 + \sqrt{13})$
	$(1.136, 0.308)$



7(d)	$\frac{1}{2} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \mathrm{e}^{\sin \theta} \cos \theta \, \mathrm{d}\theta$
	$= \frac{1}{2} \left[\mathrm{e}^{\sin \theta} \right]_{-\frac{\pi}{2}}^{\frac{\pi}{2}}$
	$= \frac{1}{2} (\mathrm{e} - \mathrm{e}^{-1})$