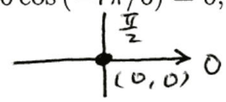
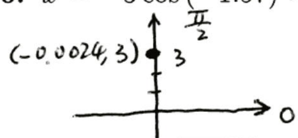
Solutions

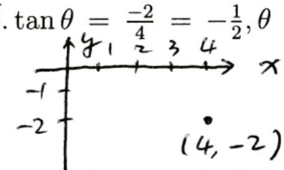
1. **Section 9.4: 4.** $x = 0\cos(-7\pi/6) = 0, y = 0\sin(-7\pi/6) = 0. (x, y) = (0, 0)$.



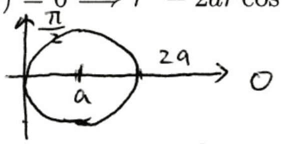
2. **Section 9.4: 6.** $x = -3\cos(-1.57) \approx -0.0024, y = -3\sin(-1.57) \approx 3. (x, y) = (-0.0024, 3)$.



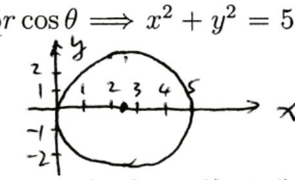
3. **Section 9.4: 14.** $r = \pm\sqrt{16+4} = \pm 2\sqrt{5}. \tan\theta = \frac{-2}{4} = -\frac{1}{2}, \theta \approx -0.464$. So $(r, \theta) = (2\sqrt{5}, -0.464)$ or $(-2\sqrt{5}, \pi - 0.464)$.



4. **Section 9.4: 22.** $x^2 + y^2 - 2ax = 0$. $x = r\cos\theta, y = r\sin\theta \implies (r\cos\theta)^2 + (r\sin\theta)^2 - 2a(r\cos\theta) = 0 \implies r^2 - 2ar\cos\theta = 0 \implies r(r - 2a\cos\theta) = 0 \implies r = 2a\cos\theta$.

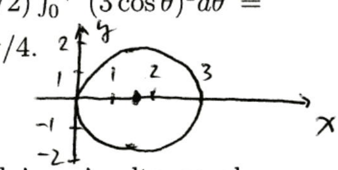


5. **Section 9.4: 32.** $r = 5\cos\theta \implies r^2 = 5r\cos\theta \implies x^2 + y^2 = 5x \implies x^2 - 5x + \frac{25}{4} + y^2 = \frac{25}{4} \implies \left(x - \frac{5}{2}\right)^2 + y^2 = \left(\frac{5}{2}\right)^2$.



6. **Section 9.4: 54.** $r = 2(1 - \sin\theta) \implies \frac{dy}{dx} = \frac{-2\cos\theta\sin\theta + 2\cos\theta(1-\sin\theta)}{-2\cos\theta\cos\theta - 2\sin\theta(1-\sin\theta)}$. At $(2, 0)$, $\theta = 0$. So $\frac{dy}{dx} = -1$. At $(3, 7\pi/6)$, $\theta = 7\pi/6$. So $\frac{dy}{dx}$ is undefined. At $(4, 3\pi/2)$, $\theta = 3\pi/2$. So $\frac{dy}{dx} = 0$.

7. **Section 9.5: 2.** (a) $A = \pi(3/2)^2 = 9\pi/4$. (b) $A = 2(1/2)\int_0^{\pi/2}(3\cos\theta)^2 d\theta = 9\int_0^{\pi/2}\cos^2\theta d\theta = \frac{9}{2}\int_0^{\pi/2}(1 + 2\cos 2\theta)d\theta = \frac{9}{2}\left[\theta + \frac{\sin 2\theta}{2}\right]_0^{\pi/2} = 9\pi/4$.



8. **Section 9.5 : 14.** $r = 3(1 + \sin\theta), r = 3(1 - \sin\theta)$. Solving simultaneously, $3(1 + \sin\theta) = 3(1 - \sin\theta) \implies \sin\theta = 0 \implies \theta = 0, \pi$. Also both curves pass through the pole: $(0, 3\pi/2)$, and $(0, \pi/2)$, respectively. So points of intersection: $(3, 0), (3, \pi), (0, 0)$.

9. **Section 9.5 : 42.** $r = 2a\cos\theta \implies r' = -2a\sin\theta \implies$
$s = \int_{-\pi/2}^{\pi/2}\sqrt{(2a\cos\theta)^2 + (-2a\sin\theta)^2}d\theta = \int_{-\pi/2}^{\pi/2} 2a d\theta = 2\pi a$.

10. **Section 9.5 : 52.** $r = a\cos\theta \implies r' = -a\sin\theta \implies$
$S = 2\pi\int_0^{\pi/2} a\cos\theta\cos\theta\sqrt{(2a\cos\theta)^2 + (-2a\sin\theta)^2}d\theta = 2\pi a^2\int_0^{\pi/2}\cos^2\theta d\theta$
$= \pi a^2\int_0^{\pi/2}(1 + 2\cos 2\theta)d\theta = \pi a^2\left[\theta + \frac{\sin 2\theta}{2}\right]_0^{\pi/2} = \pi^2 a^2/2$.