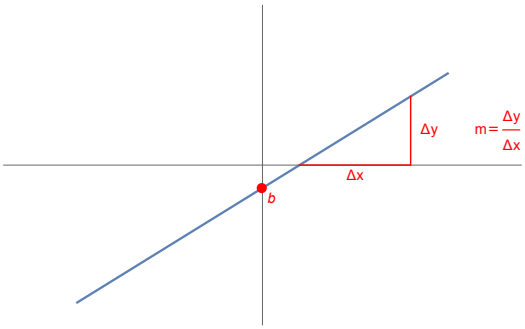
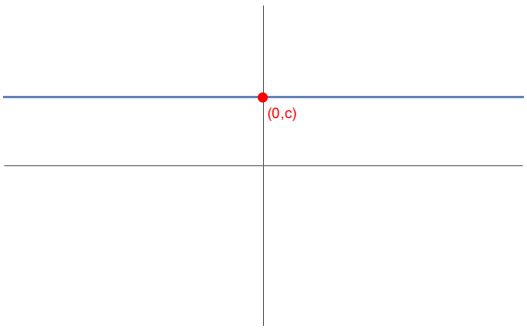
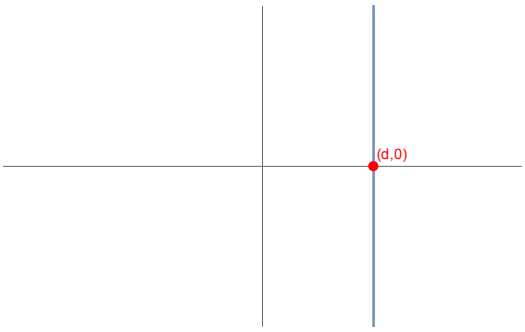
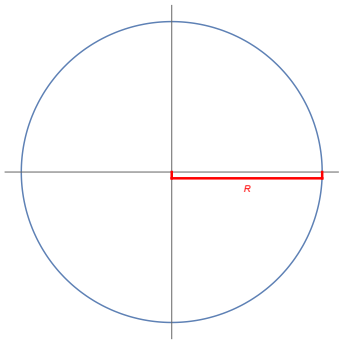
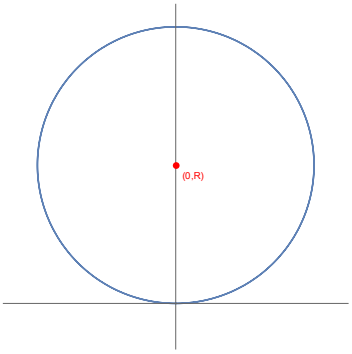
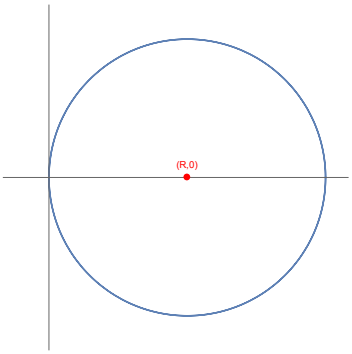
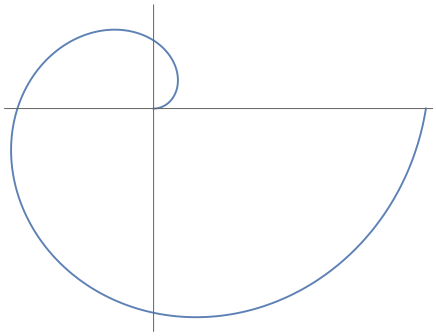
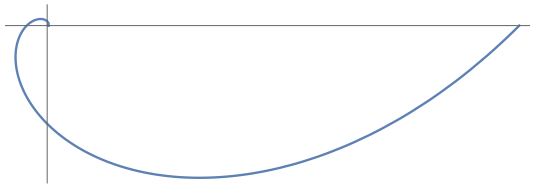
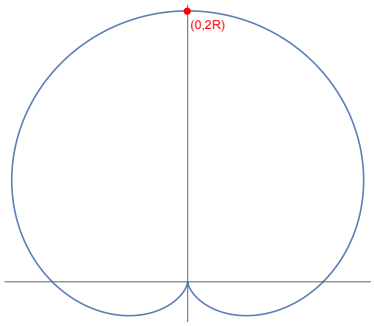
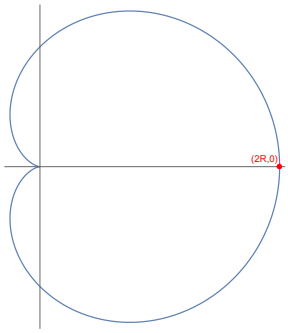
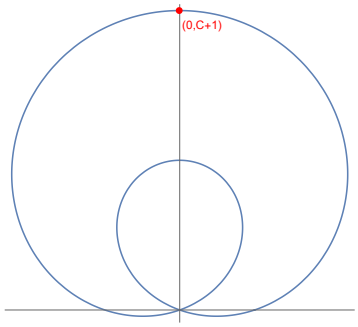
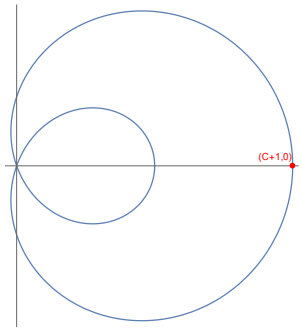
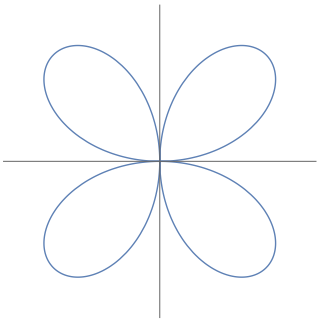
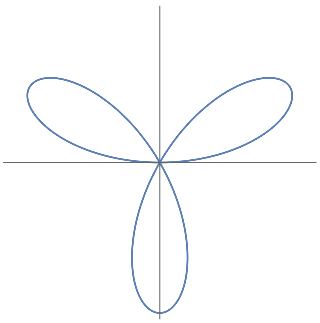
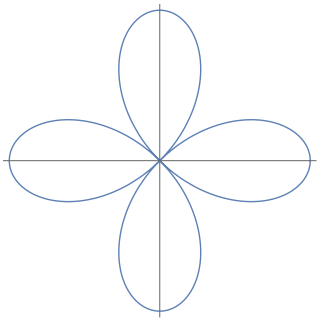
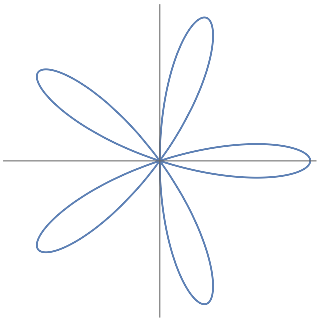
Curves You Should Know

Graph	Cartesian	Parametric	Polar
	$y = mx + b$	$x = at$ $y = ct + b,$ where $m = \dfrac{c}{a}$	$r(\theta) = \dfrac{b}{\sin\theta - m\cos\theta}$
	$y = c$	$x = at + b$ $y = c$	$r(\theta) = \dfrac{c}{\sin\theta}$
	$x = d$	$x = d$ $y = at + b$	$r(\theta) = \dfrac{d}{\cos\theta}$
	$x^2 + y^2 = R^2$	$x = R\cos t$ $y = R\sin t,$ $0 \le t \le 2\pi$	$r(\theta) = R$

Graph	Cartesian	Parametric	Polar
 ($R < 0$ flips across x-axis)	$x^2 + (y - R)^2 = 1$	$x = 2R \sin t \cos t$ $y = 2R \sin t \sin t,$ $0 \leq t \leq 2\pi$	$r(\theta) = 2R \sin \theta$
 ($R < 0$ flips across y-axis)	$(x - R)^2 + y^2 = 1$	$x = 2R \cos t \cos t$ $y = 2R \cos t \sin t,$ $0 \leq t \leq 2\pi$	$r(\theta) = 2R \cos \theta$
 ($0 \leq t \leq n\pi$ crosses x-axis n times)	$x^2 + y^2 = \arctan^2\left(\frac{y}{x}\right)$	$x = t \cos t$ $y = t \sin t,$ $0 \leq t \leq 2\pi$	$r(\theta) = \theta$
 ($0 \leq t \leq n\pi$ crosses x-axis n times)	$x^2 + y^2 = e^{2 \arctan\left(\frac{y}{x}\right)}$	$x = e^t \cos t$ $y = e^t \sin t,$ $0 \leq t \leq 2\pi$	$r(\theta) = e^\theta$

Graph	Cartesian	Parametric	Polar
 ($R < 0$ flips across x-axis)	—	$x = R(1 + \sin t)\cos t$ $y = R(1 + \sin t)\sin t,$ $0 \le t \le 2\pi$	$r(\theta) = R(1 + \sin\theta)$
 ($R < 0$ flips across y-axis)	—	$x = R(1 + \cos t)\cos t$ $y = R(1 + \cos t)\sin t,$ $0 \le t \le 2\pi$	$r(\theta) = R(1 + \cos\theta)$
 ($C < 0$ flips across x-axis) (Big/small C = big/small inner loop)	—	$x = (1 + C\sin t)\cos t$ $y = (1 + C\sin t)\sin t,$ $0 \le t \le 2\pi$	$r(\theta) = 1 + C\sin\theta$
 ($C < 0$ flips across y-axis) (Big/small C = big/small inner loop)	—	$x = (1 + C\cos t)\cos t$ $y = (1 + C\cos t)\sin t,$ $0 \le t \le 2\pi$	$r(\theta) = 1 + C\cos\theta$

Graph	Cartesian	Parametric	Polar
 ($C < 0$ flips across x-axis) $2C$ petals	—	$x = \sin(Ct)\cos t$ $y = \sin(Ct)\sin t,$ $0 \le t \le 2\pi$ C even	$r(\theta) = \sin(C\theta)$ C even
 ($C < 0$ flips across x-axis) C petals	—	$x = \sin(Ct)\cos t$ $y = \sin(Ct)\sin t,$ $0 \le t \le 2\pi$ C odd	$r(\theta) = \sin(C\theta)$ C odd
 ($C < 0$ changes nothing) $2C$ petals	—	$x = \cos(Ct)\cos t$ $y = \cos(Ct)\sin t,$ $0 \le t \le 2\pi$ C even	$r(\theta) = \cos(C\theta)$ C even
 ($C < 0$ changes nothing) C petals	—	$x = \cos(Ct)\cos t$ $y = \cos(Ct)\sin t,$ $0 \le t \le 2\pi$ C odd	$r(\theta) = \cos(C\theta)$ C odd