What Did the Girl Rock Say to the Boy Rock?

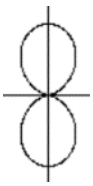
1. $(x^2+y^2)^3 = 256y^4$ Substitute $r^2 = x^2+y^2$ and $y = r\sin\theta$.

$(r^2)^3 = 256(r\sin\theta)^4$

$r^6 = 256r^4\sin^4\theta$ Divide both sides by r^4.

$r^2 = 256\sin^4\theta$ Take square roots of both sides.

$r = 16\sin^2\theta$



2. $(x^2+y^2)^3 = 64x^2y^2$ Substitute $r^2 = x^2+y^2$, $x = r\cos\theta$, and $y = r\sin\theta$.

$(r^2)^3 = 64(r\cos\theta)^2(r\sin\theta)^2$

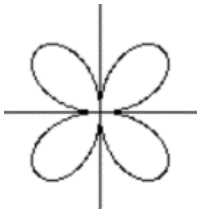
$r^6 = 16\cdot r^4\cdot 4(\cos\theta\sin\theta)^2$ Divide both sides by r^4.

$r^2 = 16\cdot 4(\cos\theta\sin\theta)^2$ Rewrite $4(\cos\theta\sin\theta)^2 = (2\cos\theta\sin\theta)^2$.

$r^2 = 16(2\cos\theta\sin\theta)^2$ Rewrite $2\cos\theta\sin\theta = \sin 2\theta$.

$r^2 = 16(\sin 2\theta)^2$ Take square roots of both sides.

$r = 4\sin 2\theta$



3. $(x^2+y^2)^5 = \left(32xy(x^2-y^2)\right)^2$ Take square roots of both sides.

$(x^2+y^2)^{5/2} = 32xy(x^2-y^2)$ Substitute $r^2 = x^2+y^2$, $x = r\cos\theta$, and $y = r\sin\theta$.

$(r^2)^{5/2} = 32(r\cos\theta)(r\sin\theta)((r\cos\theta)^2-(r\sin\theta)^2)$ Replace $(r^2)^{5/2}$ with r^5.

$r^5 = 32(r\cos\theta)(r\sin\theta)((r\cos\theta)^2-(r\sin\theta)^2)$ Factor out r^2.

$r^5 = 32r^2\cos\theta\sin\theta r^2(\cos^2\theta-\sin^2\theta)$. Rewrite $\cos^2\theta-\sin^2\theta = \cos 2\theta$

$r^5 = 32r^4\cos\theta\sin\theta(\cos 2\theta)$ Divide both sides by r^4.

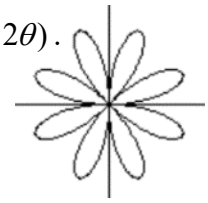
$r = 32\cos\theta\sin\theta(\cos 2\theta)$ Rewrite $32\cos\theta\sin\theta = 16\cdot(2\cos\theta\sin\theta)$.

$r = 16\cdot(2\cos\theta\sin\theta)(\cos 2\theta)$ Rewrite $2\cos\theta\sin\theta = \sin 2\theta$.

$r = 16\cdot(\sin 2\theta)(\cos 2\theta)$ Rewrite $16\cos 2\theta\sin 2\theta = 8\cdot(2\cos 2\theta\sin 2\theta)$.

$r = 8\cdot(2\cos 2\theta\sin 2\theta)$ Rewrite $2\cos 2\theta\sin 2\theta = \sin 4\theta$.

$r = 8\sin 4\theta$



4. $(x^2+y^2)^2 = 64(x^2-y^2)$ Substitute $r^2 = x^2+y^2$, $x = r\cos\theta$, and $y = r\sin\theta$.

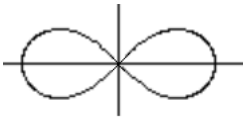
$(r^2)^2 = 64((r\cos\theta)^2-(r\sin\theta)^2)$ Factor out r^2

$r^4 = 64r^2(\cos^2\theta-\sin^2\theta)$ Divide both sides by r^2

$r^2 = 64(\cos^2\theta-\sin^2\theta)$ Rewrite $\cos^2\theta-\sin^2\theta = \cos 2\theta$

$r^2 = 64\cos 2\theta$ Take square roots of both sides.

$r = 8\sqrt{\cos 2\theta}$



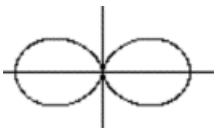
5. $(x^2+y^2)^3 = 64x^4$ Substitute $r^2 = x^2+y^2$ and $x = r\cos\theta$

$(r^2)^3 = 64(r\cos\theta)^4$

$r^6 = 64r^4\cos^4\theta$ Divide both sides by r^4

$r^2 = 64\cos^4\theta$ Take square roots of both sides.

$r = 8\cos^2\theta$



6. $(x^2+y^2)^2 = 128xy$ Substitute $r^2 = x^2+y^2$, $x = r\cos\theta$, and $y = r\sin\theta$.

$(r^2)^2 = 128(r\cos\theta)(r\sin\theta)$ Factor out r^2. Rewrite $128\cos\theta\sin\theta = 64\cdot(2\cos\theta\sin\theta)$.

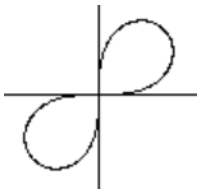
$r^4 = 128(r\cos\theta)(r\sin\theta)$ Rewrite $128\cos\theta\sin\theta = 64\cdot(2\cos\theta\sin\theta)$.

$r^4 = r^2\cdot 64\cdot(2\cos\theta\sin\theta)$ Divide both sides by r^2.

$r^2 = 64\cdot(2\cos\theta\sin\theta)$ Rewrite $2\cos\theta\sin\theta = \sin 2\theta$.

$r^2 = 64\cdot(\sin 2\theta)$ Take square roots of both sides.

$r = 8\sqrt{\sin 2\theta}$



7. $(x^2+y^2)^3 = \left(8(x^2-y^2)\right)^2$ Take square roots of both sides.

$(x^2+y^2)^{3/2} = 8(x^2-y^2)$ Substitute $r^2 = x^2+y^2$, $x = r\cos\theta$, and $y = r\sin\theta$.

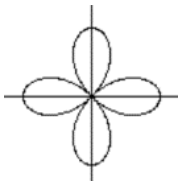
$(r^2)^{3/2} = 8((r\cos\theta)^2-(r\sin\theta)^2)$ Write $(r^2)^{3/2} = r^3$.

$r^3 = 8(r^2\cos^2\theta - r^2\sin^2\theta)$ Factor out r^2.

$r^3 = 8r^2(\cos^2\theta-\sin^2\theta)$ Divide both sides by r^2.

$r = 8(\cos^2\theta-\sin^2\theta)$ Rewrite $\cos^2\theta-\sin^2\theta = \cos 2\theta$.

$r = 8(\cos 2\theta)$



8. $(x^2+y^2)^5 = 64((x^2-y^2)^2-4x^2y^2)^2$ Take square roots of both sides.

$(x^2+y^2)^{5/2} = 8((x^2-y^2)^2-4x^2y^2)$ Substitute $r^2 = x^2+y^2$, $x = r\cos\theta$, and $y = r\sin\theta$.

$(r^2)^{5/2} = 8\left((r^2\cos^2\theta - r^2\sin^2\theta)^2 - 4r^2\cos^2\theta r^2\sin^2\theta\right)$ Replace $(r^2)^{5/2}$ with r^5. Factor out r^4.

$r^5 = 8r^4\left((\cos^2\theta-\sin^2\theta)^2-4\cos^2\theta\sin^2\theta\right)$ Divide both sides by r^4.

$r = 8\left((\cos^2\theta-\sin^2\theta)^2-4\cos^2\theta\sin^2\theta\right)$

$r = 8\left((\cos^2\theta-\sin^2\theta)^2-4\cos^2\theta\sin^2\theta\right)$ Rewrite $\cos^2\theta-\sin^2\theta = \cos 2\theta$.

$r = 64(\cos 2\theta)^2 - 4\cos^2\theta\sin^2\theta$ Rewrite $4\cos^2\theta\sin^2\theta = (2\cos\theta\sin\theta)^2$

$r = 8\left((\cos 2\theta)^2-(2\cos\theta\sin\theta)^2\right)$ Rewrite $(2\cos\theta\sin\theta)^2 = (\sin 2\theta)^2$

$r = 8\left((\cos 2\theta)^2-(\sin 2\theta)^2\right)$ Factor out 8.

$r = 8(\cos^2 2\theta - \sin^2 2\theta)$ Rewrite $\cos^2 2\theta-\sin^2 2\theta = \cos 4\theta$.

$r = 8(\cos 4\theta)$