Math 172 | Quiz 14 | Name: ____________
28 April 2016 | Show Appropriate Work | Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{2}$ Convert the following polar curves to rectangular coordinates.

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

$r^2 = 4r\cos\theta$

$x^2 + y^2 = 4x$

or

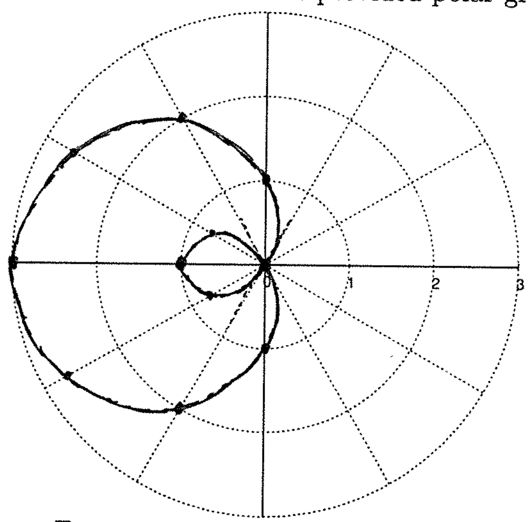
$(x-2)^2 + y^2 = 4$

(b) $r = \dfrac{2}{3\cos\theta - 4\sin\theta}$

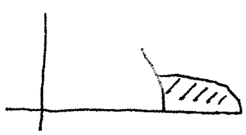
$3r\cos\theta - 4r\sin\theta = 2$

$3x - 4y = 2$

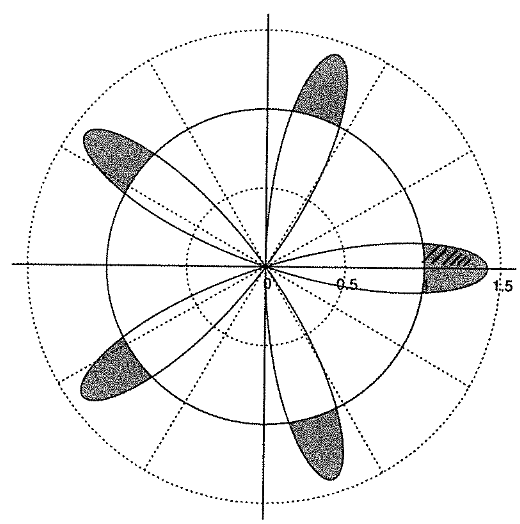
2. $\boxed{3}$ Carefully sketch the curve $r = 1 - 2\cos\theta$ on the provided polar grid.



3. $\boxed{5}$ Find the area inside $r = \sqrt{2}\cos 5\theta$ and outside $r = 1$, the shaded region in the figure. You may find the identity $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$ helpful.



By symmetry, we consider only this half petal



$$\text{Area} = 10 \cdot \frac{1}{2} \int_0^{\pi/20} \left((\sqrt{2}\cos 5\theta)^2 - 1^2 \right) d\theta$$

$$= 5\int_0^{\pi/20} \left(2\cos^2 5\theta - 1\right) d\theta = 5\int_0^{\pi/20} \cos 10\theta \, d\theta$$

$$= \frac{1}{2}\sin 10\theta \Big|_0^{\pi/20} = \frac{1}{2}$$

Bounds: $\sqrt{2}\cos 5\theta = 1$ when

$\cos 5\theta = 1/\sqrt{2}$ so

$5\theta = \pi/4$

$\theta = \pi/20$