MA 16600 Practice Questions over 12.2-12.3 and 8.3

1. Given the polar equation in terms of r and θ, write the Cartesian equation in terms of x and y. Your equation should begin with "$y =$"

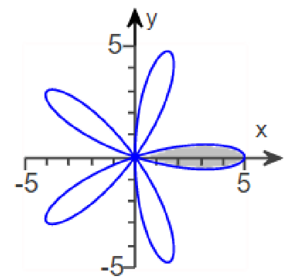
a. $r = \csc\theta$ **b.** $r = \dfrac{\tan\theta}{\cos\theta - \sin\theta}$ **c.** $r = \dfrac{1}{\cos\theta + \sin\theta}$ **d.** $r = \dfrac{2\csc\theta}{\cot\theta + r\cos\theta}$

e. $r^2\cos\theta + r\tan\theta = \sec\theta$ **f.** $r^2 = \sec^2\theta \tan\theta$

2. Given the Cartesian equation in terms of x and y, write the polar equation in terms of r and θ. Your equation should begin with "$r =$"

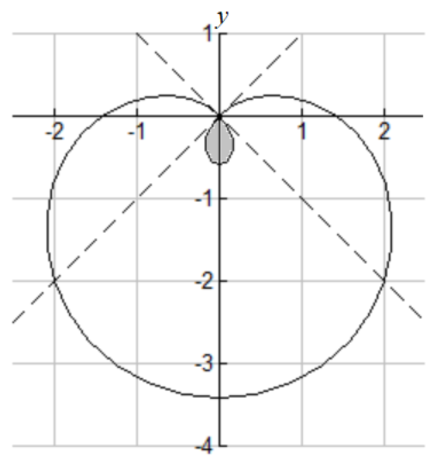
a. $x^2 + y^2 = x + y$ **b.** $x^2(x^2 + y^2) = y^2$ **c.** $y = 3 - 2x$

3. Recall the area from $\theta = \alpha$ to $\theta = \beta$ inside a polar graph is $\int_\alpha^\beta \frac{1}{2} r^2 \, d\theta$



a. Find the exact area of the region inside one leaf of the 5-leaved rose $r = 5\cos 5\theta$
You can use the FNINT command, but provide an exact area.

$$\int_{\square}^{\square} \boxed{} \, d\theta = \boxed{}$$



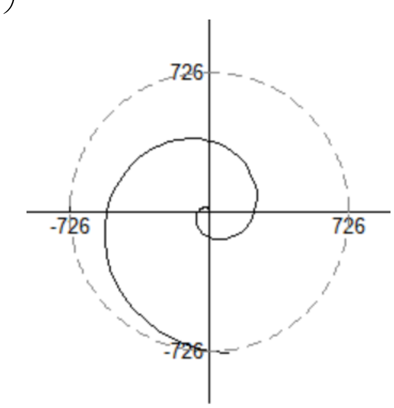
b. Set up the integral to calculate the area of the region inside the inner loop of the limaçon $r = \sqrt{2} - 2\sin\theta$. Use the FNINT command to find the area and approximate it the area to two decimal places.
To find the integration limits, find where $r = \sqrt{2} - 2\sin\theta = 0$ where $0 \le \theta < 2\pi$, since this will be where the inner loop starts and ends.
TIP: The dashed lines in the above graph are the polar equations $\theta = \alpha$ and $\theta = \beta$, where α and β are the lower and upper limits of integration. You can enter these values in your polar grapher as *θmin* and *θmax* to check that you have sketched only the inner loop.

$$\int_{\square}^{\square} \boxed{} \, d\theta \approx \boxed{}$$

c. The arc length from $\theta = 0$ to $\theta = 11$ of a polar spiral $r = 6\theta^2$ is given by $\int_0^{11} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} \, d\theta$.

Calculate the arc Report the arc length correct to the nearest whole number.
You can use the FNINT command. Round to the nearest whole number.

$$\int_0^{11} \sqrt{\boxed{}} \, d\theta \approx \boxed{}$$



Possible Bonus Questions on the Quiz Similar to These

4. Find the indefinite integrals. Show work.

a. $\int \tan^9 x \sec^2 x dx$

b. $\int \cos^2\theta d\theta$

c. $\int \sin^3 x \cos^6 x dx$

5. Consider the integral $\int \frac{\sin\theta}{\cos^2\theta} d\theta$. Which of the following

A. $\sin\theta + C$	B. $\cos\theta + C$	C. $\tan\theta + C$	D. $\csc\theta + C$	E. $\sec\theta + C$	F. $\cot\theta + C$
G. $-\sin\theta + C$	H. $-\cos\theta + C$	I. $-\tan\theta + C$	J. $-\csc\theta + C$	K. $-\sec\theta + C$	L. $-\cot\theta + C$
M. All of these	N. None of these.				

6. Consider $\int \sec^{14} x \tan^{17} x\, dx$

a. Suppose we let $u = \tan x$. Then $du =$ ________________ dx

Then we can write $\int \sec^{14} x \tan^{17} x\, dx = \int \boxed{}\, du.$

Your answer is a binomial in terms of u raised to a power multiplied by u raised to a power.
Do not multiply it out. Do not find the antiderivative. Just leave it as a polynomial.

b. Suppose we let $w = \sec x$. Then $dw =$ ________________ dx

Then we can write $\int \sec^{14} x \tan^{17} x\, dx = \int \boxed{}\, dw.$

Your answer is a binomial in terms of w raised to a power multiplied by w raised to a power.
Do not multiply it out. Do not find the antiderivative. Just leave it as a polynomial.