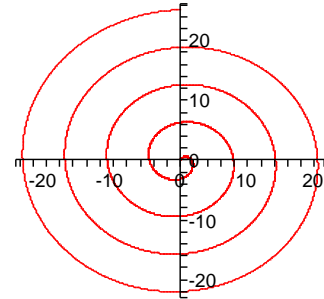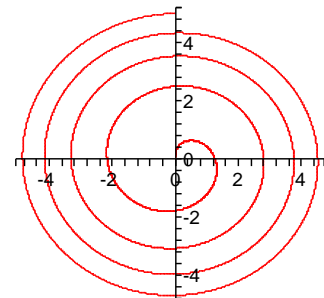Honors Math 182 Quiz 9 Version A

Feel free to use the computers, your calculator, notes and textbooks while working on this quiz. You may also use online resources such as Wikipedia, Google and Wolfram Alpha; however, do not use email or any other messaging service during the quiz.

1. Find the length of the curve given by $\big(f(t), g(t)\big)$ where t ranges over $[0, 8\pi]$ and $f(t) = t \sin t$ and $g(t) = t \cos t$.

2. Find the length of the curve given by $\big(u(t), v(t)\big)$ where t ranges over $[0, 8\pi]$ and $u(t) = t^{1/2} \sin t$ and $v(t) = t^{1/2} \cos t$.

Hint: You may want to use the `evalf` command in Maple.

3. Make the change of variables $x = \sin\theta$ in the integral $\displaystyle\int_0^{1/2} \frac{1}{\sqrt{1-x^2}}\,dx$.

4. Provided $|x| < 1$ the generalized binomial theorem implies

$$(1+x)^\alpha = \sum_{k=0}^{\infty} \binom{\alpha}{k} x^k \qquad \text{where} \qquad \binom{\alpha}{k} = \frac{1}{k!} \prod_{j=0}^{k-1} (\alpha - j).$$

Approximate $\sqrt{2}$ by computing the sums

$$S_n = \sum_{k=0}^{n} \binom{-1/2}{k} \left(-\frac{1}{2}\right)^k$$

for values of $n = 1, 2, \ldots, 5$.