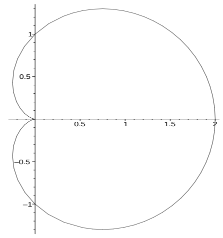
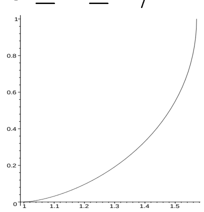
Exam II Name ________________________________ Section ______

1. (7 points each) Set up (do not evaluate) the integral to determine the following:

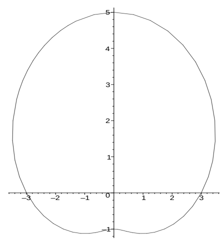
(a) The arclength of the polar curve defined by $r(\theta) = 1 + \cos\theta$ for $0 \leq \theta \leq 2\pi$ as shown.



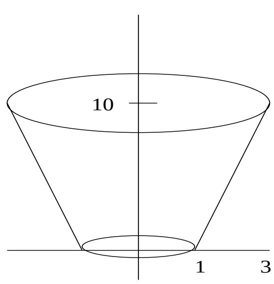
(b) The arclength of the curve defined by $\vec{r}(t) = < \cos t + t\sin t, \sin t - t\cos t >$ on $0 \leq t \leq \pi/2$.



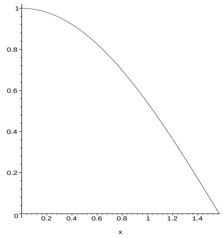
(c) The area of the polar region defined by $r(\theta) = 3 + 2\sin\theta$ on $0 \leq \theta \leq 2\pi$ as shown below.



(d) The work required to empty from the top, a tank in the shape of a truncated right circular cylinder with upper radius 3 m, lower radius 1 m, and height 10 m which is filled with gasoline (680 kg/m^3).



(e) The center of mass of the region having constant density δ and bounded by $f(x) = \cos x$, $x = 0$ and $x = \pi/2$ and $y = 0$.



2. (5 points each) Evaluate the following improper integrals.

   (a) $\displaystyle\int_0^{\infty} e^{-0.5x}\,dx$

   (b) $\displaystyle\int_0^{1} \frac{x}{\sqrt{1-x^2}}\,dx$

   (c) $\displaystyle\int_0^{\infty} \frac{x}{x^2+1}\,dx$

3. (5 points each) Determine the sum:

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{5\cdot 3^n}{2^{2n}} =$ ______

   (b) $\displaystyle\sum_{n=0}^{\infty} \frac{4\cdot 3^n}{5\cdot n!} =$

4. (5 points) Determine $T_6(x,0)$ of the function $f(x) = \cos(2x)$. (Determine the 6^{th}-degree Taylor Polynomial of $f(x) = \cos(2x)$ about $x = 0$.)

5. (5 points each) State whether the given series converges or diverges. Show reason by some test.

   (a) $\sum_{n=0}^{\infty} \frac{1}{n^2+1}$ ______________

   (b) $\sum_{n=0}^{\infty} \frac{2 \cdot 3^{2n}}{4 \cdot 7^n}$ ______________

6. (5 points) Determine the interval of convergence of the series: $\sum_{n=1}^{\infty} \frac{(x-3)^n}{n}$

Extra Credit

(a) (4 points) Determine the unit tangent vector to the polar curve defined by $r(\theta) = 3 + 2\sin\theta$ at $\theta = \pi$. This is the curve defined and shown above in 1(c).

(b) (2 points each) Calculate any (or all) of the integrals you set up in problems 1a-1e.