Math 172 **Final (Version 2)**

Name.....J Number.....Score.....

Show All Work.

1. Find the integrals.(32)
   (a) $\int \frac{x^3}{\sqrt{x^2+1}}\,dx$;
   (b) $\int x^2 \ln x\,dx$;
   (c) $\int \cos^2 x\,dx$;
   (d) $\int \frac{2}{x^2+2x}\,dx$.
2. Find the area of the region that is inside the cardioid $r = 2 - 2\cos\theta$ and outside the circle $r = 3$.(10)
3. A cylindrical tank is to be filled with gasoline weighing 50 lb/cubic ft. The tank is 20 ft high and 10 ft in diameter. A pump fills the tank through a hole in the bottom of the tank. Find the work the pump must do to fill the tank.(10)
4. Find the volume of the solid generated when the region bounded by $x = -2, x = 2\sqrt{3}, y = 0$ and $y = \frac{1}{\sqrt{4+x^2}}$ is revolved about x-axis.(10)
5. Determine whether the series absolutely converges conditionally converges or diverges.(20)
   (a) $\sum_{k=1}^{\infty} \frac{1}{\sqrt[4]{3k^5-2k}}$;
   (b) $\sum_{k=2}^{\infty}(-1)^k \frac{1}{\sqrt{k-1}+\sqrt{k+1}}$;
   (c) $\sum_{k=1}^{\infty}(-1)^k \frac{\ln^2 k}{k}$;
   (d) $\sum_{k=1}^{\infty}\left(\frac{k+1}{k+2}\right)^k$.
6. Find the function to which the series $\sum_{k=1}^{\infty} \frac{x^{k+1}}{k}$ converges.(6)
7. Find the Taylor series about $x = a$ for the given function; express your answer in sigma notation(Σ); then find its radius of convergence and the interval of convergence.(12)
   (a) $f(x) = \frac{1}{3+2x}$, at 0;
   (b) $f(x) = \ln x$, at 2.