

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

Show All Work.

1. Find the integrals.(32)
 - (a) $\int \frac{x \sin^{-1}(x^2)}{\sqrt{1-x^4}} dx$;
 - (b) $\int \frac{1}{16+t^2} dt$;
 - (c) $\int \sin^3 x \cos^{\frac{1}{2}} x dx$;
 - (d) $\int \frac{e^{2x}+e^{-2x}}{e^{2x}-e^{-2x}} dx$.

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 swimming pool is shown in the Figure. The bottom of the pool is an inclined plain. If the water level of the pool is 1 feet below the top, how much work is required to pump all the water into a drain at the top edge of the pool? (the weight density of water is 62.4 lb/cubic ft).(10)

4. Find the volume of the solid generated when the region bounded by $y = 2 - x$, $y = \sqrt{x}$ and $x = 0$ is revolved about y-axis.(10)
5. Determine whether the series absolutely converges conditionally converges or diverges.(20)
 - (a) $\sum_{k=2}^{\infty} \frac{1}{\sqrt[3]{k^5-2k}}$;
 - (b) $\sum_{k=1}^{\infty} (-1)^k \frac{k}{k^2+1}$;
 - (c) $\sum_{k=1}^{\infty} (-1)^k \frac{\ln k}{k}$;
 - (d) $\sum_{k=1}^{\infty} \frac{1}{\tan^{-1} k}$.
6. Find the function to which the series $\sum_{k=1}^{\infty} (k-2)x^{k+1}$ 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) $f(x) = \frac{1}{3+x}$, at 0;
 - (b) $f(x) = \ln x$, at 3.