1. Evaluate the following integrals

$$
\begin{array}{ll}
\text { (a) } \int \frac{\cos (\pi / x)}{x^{2}} d x & \text { (b) } \int \frac{e^{x}}{1+e^{2 x}} d x
\end{array}
$$

2. Let $I=\int_{0}^{1} x^{3} \sin \left(x^{2}\right) d x$
(a) Find a value of $n$ such that $M_{n}$ approximates $I$ accurate within 0.00001
(b) Use a Taylor series to approximate / accurate within 0.00001
(c) Find the value of $I$ exactly by finding an antiderivative
3. Let $R$ be the region in the first quadrant bounded by $y=-x^{3}+9 x$ and the $x$-axis with $x \geq 0$. Find the volume when $R$ is rotated about:
(a) the $x$-axis
(c) the line $x=-2$
(b) the $y$-axis
(d) the line $y=30$
4. Do the following improper integrals converge or diverge? Why?

$$
\text { (a) } \int_{0}^{\infty} \frac{2}{\sqrt{x}+x^{2}} d x \quad \text { (b) } \int_{1}^{\infty}\left(\frac{3}{5}\right)^{x} d x
$$

