(1) (5 points) Find the angle between the vectors \( < -1,0,1 > \) and \( < 2,-1,2 > \). You may express your answer using \( \arccos(x) \).

(2) (5 points) Find the equation of the plane containing the point \((-1,2,1)\) which is perpendicular to the line

\[
\begin{align*}
    x &= 1 + t \\
    y &= 1 - t \\
    z &= 1 + 2t
\end{align*}
\]
(3) (5 points) Evaluate $\int x^2 \cos(x^3) \, dx$.

(4) (5 points) Evaluate $\int \sqrt{x}(x^2 + x) \, dx$.

(5) (5 points) Evaluate $\int \arctan(x) \, dx$. 
(6) (5 points) Express \( f(x) = \frac{3x}{2+x} \) as a power series. Also state the interval of convergence.

(7) (5 points) Use series to approximate \( e^{-\frac{1}{10}} \) with an error less than \( 10^{-6} \). [You do not need to compute and add the terms in the sum.]

(8) (5 points) Evaluate \( \int \sin^2(x) \, dx \).
(9) (5 points) Find the area of the region bounded by the curves $x = 0$, $x = \pi$, $y = x + 3$ and $y = \sin(x)$.

(10) (5 points) **Set up (but do not evaluate)** an integral for the volume of the solid of revolution obtained by rotating the region bounded by the curves $x = 0$, $x = 1$, $y = x^3 + x + 1$ and $y = x - 1$ around the line $x = -2$.

(11) (5 points) **Set up (but do not evaluate)** an integral for the volume of the solid of revolution obtained by rotating the region bounded by the curves $x = 0$, $x = 1$, $y = x^3 + x + 1$ and $y = x - 1$ around the line $y = -2$. 
(12) (10 points) Find the interval and radius of convergence of the power series
\[ \sum_{n=0}^{\infty} \frac{\left( \frac{x}{5} \right)^n}{n} \]
(13) (15 points) Evaluate
\[ \int \frac{2}{x^3 + x} \, dx \]
(14) (10 points) Find the work done in pumping all the water out of a container which is a round sphere of radius 5 m and which is half full (i.e. the water has to be lifted to the top of the sphere before it can be removed). [You may use the approximation \( g \approx 10 \, \text{m/sec}^2 \) and \( \rho = 1000 \, \text{kg/m}^3 \).]
(15) (10 points) Approximate \( \int_0^\pi \frac{1}{1+x^2} \, dx \) with an error less than \( 10^{-12} \). (You do not need to compute and add the terms in the sum.)