(1) (5 points) Find the angle between the vectors $<3, -2, 0>$ and $<1, -1, 2>$. You may express your answer using $\arccos(x)$.

(2) (5 points) Find the parametric equation of the line perpendicular to the plane $3x - y + 4z = 5$ through the point $(-1, 2, -3)$.
(3) (5 points) Find the area of the region bounded by the curves \( x = 0, \ x = \pi, \ y = -x^3 - 1 \)
and \( y = \sin(x) \).

(4) (5 points) Evaluate \( \int x \sin(x^2) \, dx \).

(5) (5 points) Evaluate \( \int \frac{x^3 + \sqrt{x}}{x} \, dx \).
(6) (5 points) Evaluate $\int x \sin(x) \, dx$.

(7) (5 points) Express $f(x) = \frac{x}{1+x^2}$ as a power series. Also state the interval of convergence.

(8) (5 points) Use series to approximate $\cos\left(\frac{1}{10}\right)$ with an error less than $10^{-6}$. [You do not need to add the terms in the sum.]
(9) (5 points) Evaluate \( \int \sin^3(x) \, dx \).

(10) (5 points) Find the interval and radius of convergence of the power series \( \sum_{n=0}^{\infty} \left( \frac{x}{3} \right)^n \).
(11) Evaluate the following integrals:

(a) (6 points) \( \int \frac{\sin(\sqrt{x})}{\sqrt{x}} \, dx \).

(b) (8 points) Obtain the partial fraction decomposition of \( \frac{1}{x(x+1)^2} \). Also compute the constants.

(c) (5 points) Evaluate \( \int \frac{1}{x(x+1)^2} \, dx \).
(12) (12 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 \( x = 0, \ x = 1, \ y = x^2 + 5 \) and \( y = x - 1 \) around the line \( x = -3 \).

(13) (10 points) Find the work done in pumping all the water out of a full cone (with vertex down) of radius 5 m. and height 3 m. [You may use the approximation \( g \approx 10 \text{ m/sec}^2 \) and \( \rho = 1000 \text{ kg/m}^3 \).]
(14) (10 points) Find the distance from the point $(1, 2, 3)$ to the plane $2x - y + z = 4$. 
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