

## Review for Midterm II

MATH 2433-003, Honors

1. Test for convergence

a)  $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{\ln n}{n}$

b)  $\sum_{n=0}^{\infty} \frac{\cos(n\pi/3)}{n!}$

c)  $\sum_{n=1}^{\infty} \frac{n!}{n^n}$

d)  $\sum_{n=1}^{\infty} \left(\frac{n}{n+1}\right)^{n^2}$

2. Find the radius of convergence and the interval of convergence of the power series

a)  $\sum_{n=1}^{\infty} \frac{(3x-2)^n}{n3^n}$

b)  $\sum_{n=1}^{\infty} \frac{(x+1)^n}{n(n+1)}$

3. Use a power series to approximate the definite integral to 2 decimal places

$$\int_0^1 \frac{dx}{1+x^4}$$

4. a) Find Taylor series for  $f(x) = \cos x$  at  $a = \pi/4$ .

b) Find the radius of convergence of the series in a).

b) Show that the Taylor series represent  $f(x) = \cos x$ .

5. Find the Maclaurin series for  $\ln(1+x)$  and use it to calculate  $\ln 1.1$  correct to two decimal places.

6. Find an equation of a sphere that passes through the origin and whose center is  $(1, 2, 3)$ .

7. Let  $\mathbf{a} = (1, -1, 2)$ ,  $\mathbf{b} = (3, 0, -2)$ . Find  $|\mathbf{a}|$ , angle  $\theta$  between  $\mathbf{a}$  and  $\mathbf{b}$ ,  $2\mathbf{a} - \mathbf{b}$ ,  $\mathbf{a} \cdot \mathbf{b}$ ,  $\mathbf{a} \times \mathbf{b}$ ,  $\text{comp}_{\mathbf{b}}\mathbf{a}$ .

8. Find a unit vector that is orthogonal to both  $\mathbf{i} + \mathbf{j}$  and  $\mathbf{i} + \mathbf{k}$ .

9. Find a vector orthogonal to the plane through the points  $P(1, 0, -1)$ ,  $Q(2, 4, 5)$ ,  $R(3, 1, 7)$  and the area of the triangle  $PQR$ .