

**MATH 181 Exam 2**

(20) **1.** Compute the following integrals.

a)  $\int \cos^3 x \sin^2 x \, dx$

b)  $\int x^3 \ln x \, dx$

c)  $\int \frac{x^2}{\sqrt{4-x^2}} \, dx$

(20) **2.** a) Write down the FORM of the partial fraction decomposition for

$$\frac{x^6 + ex^4 + \pi x^3 + \sqrt{2}x^2 + 1000}{x^2(x-1)^3(x^2+2x+2)}.$$

Do NOT compute the coefficients. Just give the FORM of the decomposition.

b) Find the partial fraction decomposition for

$$\frac{4x^2 + 2x + 1}{x(x^2 + 1)}.$$

(20) **3.** Are the following series convergent or divergent? Explain.

a)  $\sum_{n=1}^{\infty} \frac{n}{n^2 + n + 1}$

b)  $\sum_{n=1}^{\infty} \frac{n^3}{3^n}$

c)  $\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{n(n+10)}$

(20) **4.** Find, with justification, a number  $N$  so that the sum of the first  $N$  terms of the following series are within  $10^{-2}$  of their limits.

a)  $\sum_{n=1}^{\infty} \frac{1}{n^2}$

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

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

(20) **5.** For which  $x$  does the power series

$$\sum_{n=1}^{\infty} \frac{x^n}{n3^n}$$

converge? For which of the  $x$  where it converges is the convergence conditional?