

Review sheet for Exam 2 of Math 152

These problems are presented in order to help you understand the material after the first exam and prior to the second exam. **DO NOT** assume that your second midterm exam will resemble this set of problems. The following 20 problems are not meant to be a sample exam. These problems are just a study guide. Since different sections of Math 152 have midterm exams at different times, there will be variations in the precise sections of the book that are covered in Exam 2. For example: Your Exam 2 may not go as far as the section in the book that is represented by problem 20. Also, there may be sections of the book that appear on Exam 2, but are not represented by any of the problems in this review sheet.

(1) Determine convergence or divergence of $\sum_{n=2}^{\infty} \sqrt{\frac{n^2 - n - 1}{n^4 + n^3 + 5n^2 + 7}}$.

(2) Determine convergence or divergence of $\sum_{n=2}^{\infty} \sin\left(\frac{n-1}{n^2+5}\right)$.

(3) Determine convergence or divergence of $\sum_{n=1}^{\infty} \frac{\sqrt{n+3}}{2^n}$.

(4) Determine convergence or divergence of $\sum_{n=2}^{\infty} \left(\frac{3n+10}{4n-7}\right)^n$.

(5) Determine convergence or divergence of $\sum_{n=2}^{\infty} \frac{n!(2n)!5^n}{(3n)!}$.

(6) Determine convergence or divergence of $\sum_{n=2}^{\infty} \frac{\cos(n^5)}{2^n}$.

(7) Determine convergence or divergence of $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$.

(8) Evaluate $\sum_{n=4}^{\infty} \frac{1}{(n+3)(n+4)}$.

(9) Use the Ratio Test for series to show $\lim_{n \rightarrow \infty} \frac{5^n}{n!} = 0$.

(10) Evaluate $\lim_{n \rightarrow \infty} n \left(\sqrt{n^2 + 7} - \sqrt{n^2 + 3} \right)$.

(11) Evaluate $\lim_{n \rightarrow \infty} \left(1 - \frac{10}{n}\right)^n$.

(12) Find the 3rd Taylor polynomial $T_3(x)$ of $f(x) = \sqrt{x}$ centered at $x = 4$. Use the Error Bound to find a bound for $|\sqrt{5} - T_3(5)|$.

(13) Find the first five nonzero terms of the Maclaurin series of $x^3 \cos(x^5)$.

(14) Find the first four nonzero terms of the Maclaurin series of $\frac{1}{\sqrt{1+x^3}}$.

(15) Find the interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{(-3)^n (x-2)^n}{\sqrt{n+4}}$.

(16) Find the length of the curve $y = \frac{x^3}{4} + \frac{1}{3x}$, $1 \leq x \leq 2$.

(17) Find the length of the parametric curve

$$x(t) = \sin^3 t, \quad y(t) = \cos^3 t, \quad 0 \leq t \leq \pi/4.$$

(18) Find the surface area of the surface obtained by rotating the parametric curve

$$x(t) = 1 - \cos t, \quad y(t) = t - \sin t, \quad 0 \leq t \leq \pi/2$$

about the x -axis.

(19) Show that a sphere of radius R has surface area equal to $4\pi R^2$.

(20) Consider the parametric curve

$$x(t) = t^3 - t, \quad y(t) = 4t^2, \quad -\infty < t < \infty.$$

Find the point (x_0, y_0) where the curve crosses itself. Find the two tangent lines at (x_0, y_0) .