MATH 104 TUTORIAL 9

1. Evaluate the improper integrals.

   a. $\int_0^1 \dfrac{dx}{\sqrt{x}}$

   b. $\int_{-\infty}^2 \dfrac{2\,dx}{x^2 + 4}$

   c. $\int_0^1 \dfrac{\theta + 1}{\sqrt{\theta^2 + 2\theta}}\,d\theta$

   d. $\int_0^2 \dfrac{ds}{\sqrt{4 - s^2}}$

2. Each exercise gives the first term or two of a sequence along with a recursion formula for the remaining terms. Write out the first ten term of the sequence

   a. $a_1 = 1, \quad a_{n+1} = a_n/(n + 1)$

   b. $a_1 = -2, \quad a_{n+1} = na_n/(n + 1)$

3. Find a formula for the nth term of the sequence. (Powers of 2 divided by multiples of 3)

   $$\frac{1}{9}, \frac{2}{12}, \frac{2^2}{15}, \frac{2^3}{18}, \frac{2^4}{21}, \cdots$$

4. Which of the sequences in the following questions converge and which diverge? Find the limit of the each convergent sequence.

   a. $a_n = \dfrac{1 - 2n}{1 + 2n}$

   b. $a_n = \dfrac{n + 3}{n^2 + 5n + 6}$

   c. $a_n = (-1)^n \left(1 - \dfrac{1}{n}\right)$

   d. $a_n = \left(-\dfrac{1}{2}\right)^n$

   $a_n = \left(\dfrac{n}{n + 1}\right)^n$