Test 3 Review
Dr. Graham-Squire, Spring 2020

●The test will cover sections 6.3, 6.4, 6.6, and 8.1-8.4.

●To study, you should look over your notes, labs, rework HW problems, quizzes, and problems from the notes, as well as work out practice problems given for each section. The Review Questions at the end of Chapter 8 will also be good practice (True/False (page 629) #1-9, 11, 12, Exercises # 1-29).

●The questions from previous semesters that match the material on this test are a mix of Tests 2 and 3.

- 2012: Test 2 # 1, 2, 4, 7; Test 3 # 1-5, 7

- 2013: Test 2 # 1, 3, 4, 7; Test 3 # 1-5, 8

●Calculators/Maple <u>can</u> be used on this test, but will not be allowed for some (if not all) questions. In particular, you must know how to tell if a series converges or diverges *without* using Maple, and be able to explain which test you use, and how you use it.

●Some practice problems to work on:

1. Consider the region W bounded by $y = \frac{1}{x}$, $y = 0$, $x = 1$ and $x = 3$. Find the volume of the solid obtained by rotating W about (a) the line $y = -3$ and (b) the y-axis.

2. Calculate the arc length of the curve $y = 4(x - 3)^{3/2}$ for $3 \le x \le \frac{37}{12}$.

3. A tank has the shape of an inverted circular cone with height 10 meters and base radius 4 meters. It is filled with water to a height of 8 meters. Note: The density of water is 1000 kg/cubic meter, and gravity is 9.8 m/sec^2

   (a) Find the work required to empty the tank by pumping all of the water to the top of the tank.

   (b) Find the work required to pump the water to a point that is 6 meters above the top of the tank.

4. We have a cable that weighs 3 lbs/ft attached to a bucket filled with coal that weighs 700 lbs. The bucket is initially at the bottom of a 600 ft mine shaft. Answer each of the following.

   (a) Determine the amount of work required to lift the bucket to the midpoint of the shaft.

   (b) Determine the amount of work required to lift the bucket from the midpoint of the shaft to the top of the shaft

   (c) Determine the amount of work required to lift the bucket all the way up the shaft.

5. Determine whether the sequence is convergent or divergent. If convergent, find the limit.

(a) $a_n = \dfrac{n^3 + n^2 \cos n}{n^3}$

(b) $b_n = \dfrac{\sqrt[3]{n}}{\ln n}$

6. Determine if the series is convergent or divergent. If it is convergent, find the sum. Make sure you state which convergence/divergence test you use (or if no test, then explain your reasoning).

(a) $\displaystyle\sum_{n=1}^{\infty} \dfrac{3^n}{5^{n+2}}$

(b) $\displaystyle\sum_{n=1}^{\infty} \left(\dfrac{1}{n} - \dfrac{1}{n+2} \right)$

(c) $\displaystyle\sum_{n=1}^{\infty} \dfrac{3n^2 + 8}{(10n+1)^2}$

7. Test the series for convergence or divergence. If it converges, state whether it is absolutely convergent or not.

(a) $\displaystyle\sum_{n=2}^{\infty} \dfrac{(-5)^n - 7}{4^n}$

(b) $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1} \dfrac{\sqrt[3]{n^4} + 10}{n^2}$

(c) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \dfrac{n^4}{3^n}$

8. (a) Find the sum of $\displaystyle\sum_{n=1}^{\infty} \dfrac{(-1)^{n+1}}{n^4}$ correct to four decimal places. (b) How would you find the approximation if it was a 1 in the numerator instead of $(-1)^{n+1}$ (That is, how would you figure out how many terms you need to add up)?