

Test 3 - MTH 1420
Dr. Adam Graham-Squire, Spring 2020

Name: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

(signature)

DIRECTIONS

1. Don't panic.
2. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.
3. Read every question carefully, follow all instructions, and answer every question. Clearly indicate your answer by putting a box around it.
4. Calculators and/or Maple are allowed on ALL questions of the test, however you should still show all of your work. Specifically, you should explain steps you do to set up integrals and give reasons for integral tests—you should consider Maple as a means to *check* your answer. Most of the points will be for the work, not the answer (since that is easy to find if you have Maple).
5. You should not have any other websites or programs up on your computer screen other than blackboard/Honorlock and Maple.
6. You should not have anything in your work area other than blank paper, a calculator (if you want it) and (if you print) a copy of the test.
7. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
8. Make sure you sign the pledge.
9. Number of questions = ???. Total Points = ???.

1. (5 points) Determine whether the sequence (SEQUENCE, not series) converges or diverges. If it converges, find the limit. For full credit, you must explain/show your work. You can use Maple to check your answer, but you will only receive credit for work shown.

(a) $a_n = \frac{\cos(5n)}{2 + \sqrt[3]{n}}$

→ (a) $-1 \leq \cos(5n) \leq 1$

$\Rightarrow \frac{-1}{2 + \sqrt[3]{n}} \leq \frac{\cos(5n)}{2 + \sqrt[3]{n}} \leq \frac{1}{2 + \sqrt[3]{n}}$

$\Rightarrow \lim_{n \rightarrow \infty} \left(\frac{-1}{2 + \sqrt[3]{n}} \right) \leq \lim_{n \rightarrow \infty} \left(\frac{\cos(5n)}{2 + \sqrt[3]{n}} \right) \leq \lim_{n \rightarrow \infty} \left(\frac{1}{2 + \sqrt[3]{n}} \right)$

$-\frac{1}{\infty} \leq \lim_{n \rightarrow \infty} \frac{\cos(5n)}{2 + \sqrt[3]{n}} \leq \frac{1}{\infty}$

$0 \leq \quad \leq 0$

$\Rightarrow \lim_{n \rightarrow \infty} \frac{\cos(5n)}{2 + \sqrt[3]{n}} = 0$

by Squeeze.

converges

(b) $a_n = \sqrt{\frac{7 + 3n^2}{12n^2 + 5n}}$

(b) $\lim_{n \rightarrow \infty} \sqrt{\frac{(7 + 3n^2) \frac{1}{n^2}}{(12n^2 + 5n) \frac{1}{n^2}}}$

$= \lim_{n \rightarrow \infty} \sqrt{\frac{(\frac{7}{n^2} + 3)}{(12 + \frac{5}{n})}}$

$= \sqrt{\frac{3}{12}}$

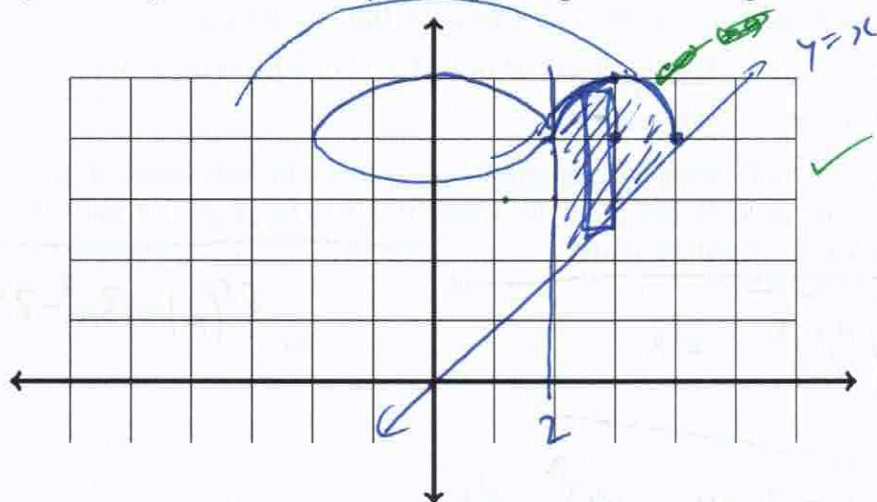
$= \sqrt{\frac{1}{4}}$

$= \frac{1}{2}$

Converges to $\frac{1}{2}$

+1 if ~~you~~ some work and say diverges

2. (5 points) Let A be the region between the functions $y = 5 - (x - 3)^4$, $y = x$ from $x = 2$ to $x = 4$ (you may want to graph that). Calculate the volume of the solid generated by rotating A around the y -axis by doing the following:



(a) Set up, but do not integrate, the integral to calculate this volume.

(b) Is your integral in (a) integrable by hand? Explain why or why not.

(c) Use Maple to calculate the integral from (a).

⇒ (a) Shells: $2\pi r h$

(round to nearest 0.01)

$r = x$

$h = (5 - (x - 3)^4 - x)$ ^{top - bottom}

$$V = 2\pi \int_2^4 x(5 - (x - 3)^4 - x) dx$$

(b) Yes! If you multiply it all out, it is just a polynomial, and you use power rule on each term.

$$(c) \frac{304\pi}{15} = 63.67$$

