MATH 2300: Calculus II, Fall 2014
MIDTERM #2

Wednesday, October 15, 2014

YOUR NAME:

Choose Your CORRECT Section

◯ **001** M. Pelfrey .....(9am)
◯ **002** E. Angel .....(10am)
◯ **003** E. Angel .....(11am)
◯ **004** J. Harper .....(12pm)
◯ **005** B. Chhay .....(2pm)
◯ **006** S. Weinell .....(3pm)
◯ **007** C. Blakestad .....(8am)
◯ **008** P. Washabaugh .....(1pm)
◯ **009** J. Harper .....(3pm)
◯ **010** K. Parker .....(4pm)

Important note: SHOW ALL WORK. BOX YOUR ANSWERS. Calculators are not allowed. No books, notes, etc. Throughout this exam, please provide exact answers where possible. That is: if the answer is $1/2$, do not write 0.499 or something of that sort; if the answer is π, do not write 3.14159.

Problem	Points	Score
1	10	
2	14	
3	12	
4	11	
5	15	
6	10	
7	18	
8	10	
TOTAL	100	

"On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work."

SIGNATURE:

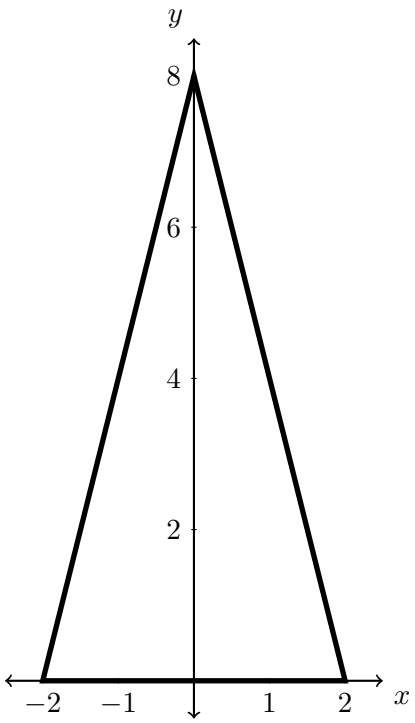
1. (2 points each) Match the recursively defined sequences in (a)-(e) to the sequences described in (I)-(V):

(a) $s_n = s_{n-1} + n$ for $n > 1$ and $s_1 = 1$	(I) $1, 3, 7, 15, \ldots$
(b) $s_n = s_{n-1} + \frac{1}{2}s_{n-2}$ for $n > 2$, $s_1 = 2$, $s_2 = 4$	(II) $2, 4, 7, 11, \ldots$
(c) $s_n = 2s_{n-1} + 1$ for $n > 1$ and $s_1 = 1$	(III) $1, 3, 6, 10, \ldots$
(d) $s_n = (s_{n-1})^2 - n$ for $n > 2$, $s_1 = 1$, $s_2 = 3$	(IV) $1, 3, 6, 32, \ldots$
(e) $s_n = s_{n-1} + n$ for $n > 1$ and $s_1 = 2$	(V) $2, 4, 5, 7, \ldots$

Write your answers below:

(a) _____ (b) _____ (c) _____ (d) _____ (e) _____

2. (14 points) Set up definite integrals computing the center of mass of an isosceles triangle whose density is δ g/cm^2, height is 8 cm, and base 4 cm. You do not need to solve the definite integrals.



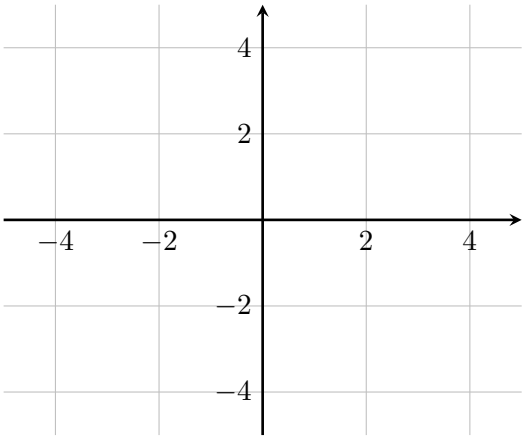
3. (12 points) The region bounded by the curves $y = x^4$ and $y = x$ is rotated around the x-axis. Compute the volume of the solid generated.

4. (11 points total)

(a) Find the Taylor polynomial of degree 2 approximating $f(x) = \dfrac{2}{x+1}$ about $x = 0$.

(b) Find the Taylor polynomial of degree 2 approximating $f(x) = \dfrac{2}{x+1}$ about $x = 2$.

5. (a) (3 points) Make a sketch of the cardioid $r = 2 + 2\cos\theta$ and the circle $r = 1$ on the coordinate plane below. Shade the area inside the cardioid $r = 2 + 2\cos\theta$ but outside the circle $r = 1$.



(b) (4 points) Calculate the polar coordinates of any points of intersection between $r = 2 + 2\cos\theta$ and $r = 1$.

(c) (8 points) Set up an integral to compute the area inside $r = 2 + 2\cos\theta$ but outside $r = 1$. You do not need to solve the integral.

6. (a) (5 points) Simplify $-9+3-1+\dfrac{1}{3}-\cdots+\dfrac{1}{3^7}$. Write the best option: _____

(I) $9\left(\dfrac{1-(-1/3)^8}{1-(-1/3)}\right)$ (II) $-9\left(\dfrac{1-(-1/3)^8}{1-(-1/3)}\right)$ (III) $9\left(\dfrac{1-(-1/3)^9}{1-(-1/3)}\right)$

(IV) $-9\left(\dfrac{1-(-1/3)^9}{1-(-1/3)}\right)$ (V) $-9\left(\dfrac{1-(-1/3)^{10}}{1-(-1/3)}\right)$ (VI) $9\left(\dfrac{1-(-1/3)^{10}}{1-(-1/3)}\right)$

(b) (5 points) Find the sum of the geometric series $8-2+\dfrac{1}{2}-\dfrac{1}{8}+\dfrac{1}{32}+\cdots$

7. (6 points each) The following integrals represent the volume of either a sphere or a cone and the variable of integration measures length. In each case, **CIRCLE** which shape is represented and give the radius of the sphere or the radius and height of the cone. Make a sketch to support your answer showing the variable and all other relevant quantities.

(a) $\int_0^1 \pi(2x)^2 dx$

- SPHERE SKETCH:

  Radius =

- CONE

  Radius =

  Height =

(b) $\int_{-4}^4 \pi(16 - h^2) dh$

- SPHERE SKETCH:

  Radius =

- CONE

  Radius =

  Height =

(c) $\int_0^5 \pi \left(\frac{5-y}{5}\right)^2 dy$

- SPHERE SKETCH:

  Radius =

- CONE

  Radius =

  Height =

8. (10 points total) No justification is necessary for the questions below.

(a) Let $s_n = \dfrac{3n + (-1)^n \cdot 2}{7n - (-1)^n \cdot 4}$.

- Does (s_n) converge or diverge? _____

- If (s_n) converges, to what value does (s_n) converge? _____

(b) Let $t_n = \dfrac{n}{5} + \dfrac{3}{n^2}$

- Does (t_n) converge or diverge? _____

- If (t_n) converges, to what value does (t_n) converge? _____