MATH 1042 **RECOMMENDED HOMEWORK PROBLEMS** **Spring 2024**

1. Text: James Stewart, *Calculus, Early Transcendentals*, **8**th Edition, Cengage Learning.

2. *Math 1042 Additional Homework Problems*

These problems define the scope of the course. Mastery of a section can be judged by your ability to solve **every** problem listed below for that section.

The problems with boxed $\boxed{\textbf{numbers}}$ are also available on WebAssign.

Chapter 5: Integrals

5.2: $\boxed{\textbf{33}}$, $\boxed{\textbf{34}}$, $\boxed{\textbf{37}}$, 39, $\boxed{\textbf{47}}$, 48, $\boxed{\textbf{49}}$, 50, 51, $\boxed{\textbf{53}}$

5.3: $\boxed{\textbf{3}}$, 5, $\boxed{\textbf{7}}$, 8, $\boxed{\textbf{13}}$, 14, 16, $\boxed{\textbf{19}}$, 20, 21, $\boxed{\textbf{23}}$, 24, $\boxed{\textbf{25}}$, 26, $\boxed{\textbf{27}}$, 28, $\boxed{\textbf{29}}$, 32, 34, 35, $\boxed{\textbf{37}}$, $\boxed{\textbf{39}}$, 40, 42, 45, 47, 64, 65, $\boxed{\textbf{73}}$

5.4: 6, $\boxed{\textbf{9}}$, $\boxed{\textbf{11}}$, $\boxed{\textbf{12}}$, 14, $\boxed{\textbf{16}}$, $\boxed{\textbf{28}}$, 29, $\boxed{\textbf{31}}$, 32, $\boxed{\textbf{33}}$, 36, $\boxed{\textbf{37}}$, 39, $\boxed{\textbf{49}}$, $\boxed{\textbf{50}}$, $\boxed{\textbf{59}}$, 60, $\boxed{\textbf{64}}$; **Also do A5: 1**

5.5: 2, $\boxed{\textbf{4}}$, $\boxed{\textbf{5}}$, $\boxed{\textbf{7}}$, 12, $\boxed{\textbf{13}}$, 16, $\boxed{\textbf{17}}$, 18, $\boxed{\textbf{21}}$, $\boxed{\textbf{23}}$, $\boxed{\textbf{25}}$, 27, $\boxed{\textbf{28}}$, 31, $\boxed{\textbf{34}}$, $\boxed{\textbf{40}}$, $\boxed{\textbf{41}}$, 42, $\boxed{\textbf{44}}$, $\boxed{\textbf{45}}$, 46, $\boxed{\textbf{53}}$, $\boxed{\textbf{55}}$, $\boxed{\textbf{57}}$, 58, $\boxed{\textbf{59}}$, $\boxed{\textbf{68}}$, $\boxed{\textbf{69}}$, $\boxed{\textbf{71}}$

Chapter 6: Applications of Integration

6.1: $\boxed{\textbf{1}}$, $\boxed{\textbf{4}}$, $\boxed{\textbf{5}}$, $\boxed{\textbf{9}}$, $\boxed{\textbf{11}}$, 14, 16, $\boxed{\textbf{17}}$, 18, 20, $\boxed{\textbf{21}}$, 22, $\boxed{\textbf{24}}$, 29, 33

6.2: $\boxed{\textbf{1}}$, 2, $\boxed{\textbf{3}}$, 4, $\boxed{\textbf{5}}$, $\boxed{\textbf{7}}$, 8, $\boxed{\textbf{9}}$, 11, 12, $\boxed{\textbf{13}}$, $\boxed{\textbf{15}}$, 17, any few from 19-30 (in Problems 19–30 only set up the integrals, do not evaluate them), $\boxed{\textbf{54}}$, $\boxed{\textbf{56}}$, $\boxed{\textbf{57}}$, $\boxed{\textbf{58}}$, 59

Chapter 7: Techniques of Integration

7.1: $\boxed{\textbf{1}}$, 2, $\boxed{\textbf{3}}$, $\boxed{\textbf{5}}$, $\boxed{\textbf{7}}$, $\boxed{\textbf{9}}$, $\boxed{\textbf{11}}$, 12, 23, $\boxed{\textbf{24}}$, $\boxed{\textbf{26}}$, 27, 33, 37, $\boxed{\textbf{41}}$, $\boxed{\textbf{57}}$, 58, 65; **Also do A7: 1**

7.2: $\boxed{\textbf{1}}$, $\boxed{\textbf{3}}$, 4, 5, $\boxed{\textbf{7}}$, 9, $\boxed{\textbf{11}}$, 12, 13, 15, $\boxed{\textbf{16}}$, 17, $\boxed{\textbf{21}}$, 22, $\boxed{\textbf{23}}$, $\boxed{\textbf{25}}$, $\boxed{\textbf{27}}$, 28, $\boxed{\textbf{29}}$, 30, $\boxed{\textbf{33}}$, 38, $\boxed{\textbf{57}}$, 58, $\boxed{\textbf{61}}$, $\boxed{\textbf{63}}$; **Also do A7: 2, 4, 5, 6**

7.3: 1, $\boxed{\textbf{2}}$, $\boxed{\textbf{3}}$, $\boxed{\textbf{4}}$, 5, 6, $\boxed{\textbf{7}}$ (in problem 7, take $a = 2$), 8, $\boxed{\textbf{9}}$, $\boxed{\textbf{12}}$, $\boxed{\textbf{13}}$, 22, $\boxed{\textbf{37}}$

7.4: 1, 3, 5, $\boxed{\textbf{7}}$, $\boxed{\textbf{8}}$, $\boxed{\textbf{9}}$, $\boxed{\textbf{12}}$, 16, $\boxed{\textbf{17}}$, $\boxed{\textbf{19}}$, 21, 22, $\boxed{\textbf{23}}$, 28, $\boxed{\textbf{64}}$, $\boxed{\textbf{65}}$

7.8: $\boxed{\textbf{1}}$, 2, $\boxed{\textbf{6}}$, $\boxed{\textbf{7}}$, $\boxed{\textbf{9}}$, $\boxed{\textbf{11}}$, $\boxed{\textbf{13}}$, $\boxed{\textbf{14}}$, $\boxed{\textbf{17}}$, $\boxed{\textbf{19}}$, $\boxed{\textbf{21}}$, 22, $\boxed{\textbf{23}}$, 24, 27, $\boxed{\textbf{29}}$, $\boxed{\textbf{32}}$, 37, 42, $\boxed{\textbf{43}}$, 45 (in Problems 42, 43, and 45, make a **rough sketch, do not use a graphing calculator**), $\boxed{\textbf{49}}$, 50, $\boxed{\textbf{51}}$, $\boxed{\textbf{52}}$: **Also do A7: 7, 8**

Chapter 11: Infinite Sequences and Series

11.1: $\boxed{\mathbf{23}}$, $\boxed{\mathbf{25}}$, 27, 28, $\boxed{\mathbf{29}}$, 30, 32, $\boxed{\mathbf{33}}$, $\boxed{\mathbf{35}}$, 36, $\boxed{\mathbf{37}}$, 40, $\boxed{\mathbf{41}}$, 48, $\boxed{\mathbf{49}}$, $\boxed{\mathbf{50}}$, 51, $\boxed{\mathbf{55}}$, 72, $\boxed{\mathbf{73}}$, $\boxed{\mathbf{75}}$

11.2: $\boxed{\mathbf{1}}$, $\boxed{\mathbf{3}}$, 4, $\boxed{\mathbf{15}}$, $\boxed{\mathbf{21}}$, $\boxed{\mathbf{22}}$, 23, 24, 25, 26, 29, $\boxed{\mathbf{31}}$, 32, $\boxed{\mathbf{33}}$, 34, 36, $\boxed{\mathbf{37}}$, 38, $\boxed{\mathbf{39}}$, $\boxed{\mathbf{43}}$, $\boxed{\mathbf{44}}$, 46, $\boxed{\mathbf{47}}$, $\boxed{\mathbf{57}}$, $\boxed{\mathbf{59}}$, 63

11.3: $\boxed{\mathbf{7}}$, $\boxed{\mathbf{8}}$, $\boxed{\mathbf{9}}$, 10, $\boxed{\mathbf{15}}$, $\boxed{\mathbf{17}}$, 19, $\boxed{\mathbf{21}}$, $\boxed{\mathbf{27}}$

11.4: $\boxed{\mathbf{1}}$, $\boxed{\mathbf{2}}$, 3, $\boxed{\mathbf{5}}$, $\boxed{\mathbf{7}}$, 8, $\boxed{\mathbf{9}}$, 10, 11, 13, $\boxed{\mathbf{15}}$, $\boxed{\mathbf{19}}$, $\boxed{\mathbf{23}}$, 24, 25, $\boxed{\mathbf{27}}$, $\boxed{\mathbf{28}}$, $\boxed{\mathbf{31}}$: **Also do A11: 1**

11.5: $\boxed{\mathbf{5}}$, $\boxed{\mathbf{7}}$, $\boxed{\mathbf{9}}$, $\boxed{\mathbf{11}}$, $\boxed{\mathbf{13}}$, 14, $\boxed{\mathbf{17}}$, 18

11.6: $\boxed{\mathbf{1}}$, $\boxed{\mathbf{2}}$, $\boxed{\mathbf{4}}$, $\boxed{\mathbf{5}}$, 6, $\boxed{\mathbf{7}}$, $\boxed{\mathbf{9}}$, $\boxed{\mathbf{11}}$, $\boxed{\mathbf{12}}$, $\boxed{\mathbf{13}}$, $\boxed{\mathbf{14}}$, 15, 16 (You may also use the Root Test anywhere it applies), $\boxed{\mathbf{18}}$, $\boxed{\mathbf{19}}$, 20, $\boxed{\mathbf{25}}$, 26, 27, $\boxed{\mathbf{28}}$, $\boxed{\mathbf{29}}$, 30, $\boxed{\mathbf{31}}$, 32, 33, 35, $\boxed{\mathbf{37}}$

11.8: $\boxed{\mathbf{3}}$, $\boxed{\mathbf{4}}$, $\boxed{\mathbf{5}}$, $\boxed{\mathbf{6}}$, $\boxed{\mathbf{7}}$, 8, $\boxed{\mathbf{9}}$, 11, 13, $\boxed{\mathbf{15}}$, $\boxed{\mathbf{17}}$, $\boxed{\mathbf{18}}$, $\boxed{\mathbf{19}}$, $\boxed{\mathbf{29}}$, $\boxed{\mathbf{30}}$

11.9: $\boxed{\mathbf{3}}$, 4, $\boxed{\mathbf{5}}$, 6, $\boxed{\mathbf{8}}$, $\boxed{\mathbf{13}}$, 14, $\boxed{\mathbf{15}}$, $\boxed{\mathbf{16}}$, $\boxed{\mathbf{17}}$, $\boxed{\mathbf{25}}$, 26, $\boxed{\mathbf{28}}$; **Also do A11: 2, 3**

11.10: $\boxed{\mathbf{3}}$, $\boxed{\mathbf{4}}$, $\boxed{\mathbf{6}}$, 7, 8, 9, 22, 23, 24, 25, 26 (in Problems 21–26, only find the **first four nonzero terms of the Taylor Series**), $\boxed{\mathbf{35}}$, $\boxed{\mathbf{37}}$, 38, $\boxed{\mathbf{39}}$, $\boxed{\mathbf{40}}$, 54, $\boxed{\mathbf{55}}$, $\boxed{\mathbf{56}}$

11.11: 3, 4, 5, 6, 7 (in Problems 3–7, do not graph f and T_3)

A5: Integrals

1. A particle moves along a line with velocity function $v(t) = t - \frac{8}{t^2}$, where v is measured in centimeters per second.

   (a) Find the displacement during the interval [1, 4]
   (b) Find the distance traveled during the interval [1, 4]

A7: Techniques of Integration

1. A particle moves along a line with velocity function $\mathbf{v}(t) = (t-1)e^{-t}$, where $\mathbf{v}$ is measured in meters per minute.

   (a) Find the displacement during the interval [0, 2]
   (b) Find the distance traveled during the interval [0, 2]

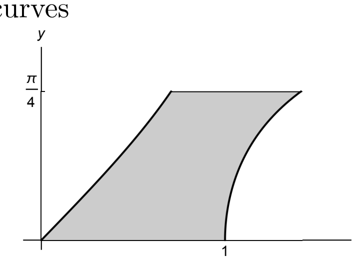
2. The base of a solid is the region R bounded by the curve $y = \sin x$ and the lines $y = x$ and $x = \pi/2$.

   (a) Sketch the base R.
   (b) If the cross-sections of the solid perpendicular to the x-axis are isosceles right triangles with hypotenuse in the base. Express the volume of the described solid as a definite integral and then find the volume.

3. The region R in the xy-plane is bounded by the curves $y = 2\cos x$, $y = \tan x$ and the lines $x = 0$, $x = \pi/4$.

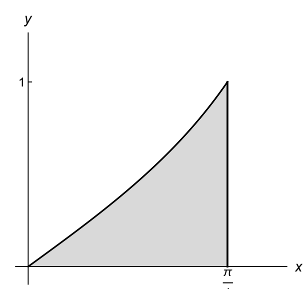
   (a) Sketch the region R.
   (b) Find the area of the region R.
   (c) Find the volume of the solid with region R as its base if its cross-sections perpendicular to the x-axis are squares.
   (d) Find the volume of the solid obtained by rotating the region R about the x-axis.

4. The region D (given in the picture) in the xy-plane is bounded by the curves $y = \arcsin x$, $y =$arcsec(x) and the lines $y = 0$, $y = \pi/4$.



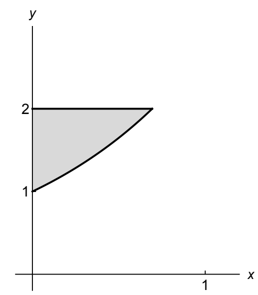
   (a) Find the volume of the solid with region D as its base if its cross-sections perpendicular to y-axis are squares.
   (b) Find the volume of the solid obtained by rotating the region D about y-axis.

5. The region D (given in the picture) in the xy-plane is bounded by the curves $y = \tan x$, $y = 0$, and $x = \frac{\pi}{4}$.



   (a) Find the volume of the solid with region D as its base if its cross-sections perpendicular to x-axis are isoscele right triangles with base in the base.
   (b) Find the volume of the solid obtained by rotating the region D about x-axis.
   (c) Find the volume of the solid obtained by rotating the region D about $y = 1$.

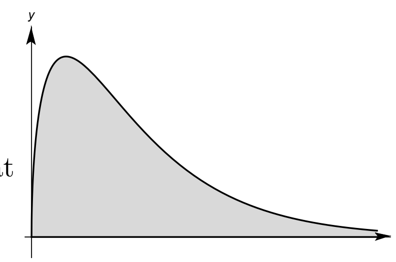
6. The region R (given in the picture) in the xy-plane is bounded by the curves $y = e^x$, $y = 2$, and $x = 0$.



   (a) Set up the integral to find the volume of the solid obtained by rotating the region R about y-axis. Don't evaluate it.

   (b) Set up the integral to find the volume of the solid obtained by rotating the region R about $x = 1$. Don't evaluate it.

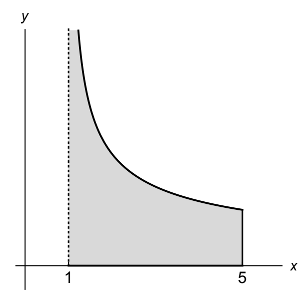
7. Consider the region $D = \{(x, y) \mid x \geq 0,\ 0 \leq y \leq \sqrt{x}\, e^{-x}\}$ as shown in the picture. A solid S is generated by revolving the region D about x-axis.



   (a) Write the volume of the solid first as an improper integral and then as a limit of proper definite integrals.

   (b) Find the volume of the solid if it is finite. Otherwise, state that it is infinite.

8. Consider the region $D = \{(x, y) \mid 1 < x \leq 5,\ 0 \leq y \leq \dfrac{1}{\sqrt{x-1}}\}$ as shown in the picture. A solid S is generated by revolving the region D about x-axis.



   (a) Write the volume of the solid first as an improper integral and then as a limit of proper definite integrals.

   (b) Find the volume of the solid if it is finite. Otherwise, state that it is infinite.

A11: Infinite Sequences and Series

1. Determine whether the series converges or diverges. Which series test justifies your answer?

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{3 + \sin n}{\sqrt{n}}$ **(b)** $\displaystyle\sum_{n=1}^{\infty} \frac{3 + \sin n}{n\sqrt{n}}$ **(c)** $\displaystyle\sum_{n=1}^{\infty} \frac{4^n}{3^n + 5^n}$ **(d)** $\displaystyle\sum_{n=1}^{\infty} \frac{5^n}{3^n + 4^n}$

2. If $f(x) = \displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n\, x^{2n}}{4^n (2n)!}$

   (a) Find $f'(x)$. Simplify and give your answer in a summation notation.

   (b) Evaluate $\displaystyle\int f(x)\, dx$. Simplify and give your answer in a summation notation.

3. If $f(x) = \displaystyle\sum_{n=0}^{\infty} \frac{5^n (x-4)^{n+1}}{(n+3)(n+1)!}$

   (a) Find $f'(x)$. Simplify and give your answer in a summation notation.

   (b) Evaluate $\displaystyle\int f(x)\, dx$. Simplify and give your answer in a summation notation.