

## Math 182 - Study Guide For Exam #1

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These are just some examples to review for your first exam, to fully prepare yourself for the exam you should know the materials from all of the sections that we have covered as well as the concept of examples we did in the class along mastering all your homework assignments.

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1. Evaluate the integral if it is convergent.

$$\int_0^{\infty} e^{-3x} dx$$

2. Find a formula for the general term  $a_n$  of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{ -\frac{1}{2}, \frac{16}{3}, -\frac{81}{4}, \frac{256}{5}, -\frac{625}{6}, \dots \right\}$$

3. Determine whether the sequence defined by  $a_n = \frac{n^2 - 5}{6n^2 + 1}$  converges or diverges. If it converges, find its limit.

4. Determine whether the improper integral converges or diverges, and if it converges, find its value.

$$\int_3^{\infty} \frac{1}{x^3} dx$$

5. Determine whether the improper integral converges or diverges, and if it converges, find its value.

$$\int_{-\infty}^{\infty} \frac{3e^x}{3 + e^{2x}} dx$$

6. Let  $a$  and  $b$  be real numbers. What integral must appear in place of the question mark "?" to make the following statement true?

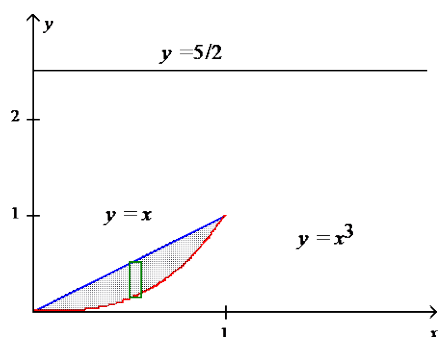
$$\int_{-\infty}^a \frac{10}{x^2 + 9} dx + \int_a^{\infty} \frac{10}{x^2 + 9} dx = ? + \int_b^{\infty} \frac{10}{x^2 + 9} dx$$

7. Find the volume of the solid obtained by rotating the region above the  $x$ -axis and bounded by  $y = x^3$  and  $x = y^3$  rotated around the  $x$ -axis.

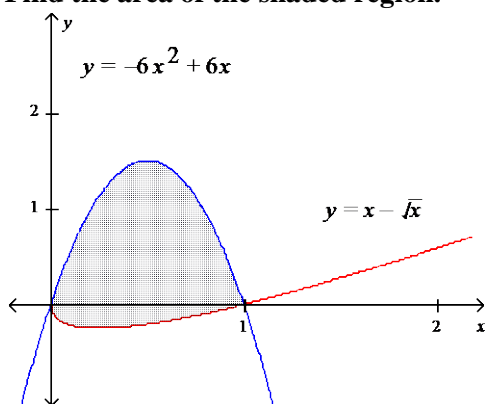
8. Find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the indicated line.

$$y = 4 - x^2, y = 0; \text{ the line } y = 5$$

9. Find the volume of the solid that is obtained by revolving the region about the line  $y = \frac{5}{2}$ .



10. Find the area of the shaded region.



11. Sketch the region bounded by the graphs of the given equations and find the area of their region.

$$x = y^2 + 3, x = y - 2, y = -1, y = 1$$

12. Evaluate the indefinite integral.

$$\int \cos^6 x \sin x \, dx$$

13. Evaluate the indefinite integral.

$$\int 7e^{\cos x} \sin x \, dx$$

14. Evaluate the integral.

$$\int x^2 \sqrt{x^3 + 2} \, dx$$

15. Evaluate the indefinite integral.

$$\int \frac{e^x}{e^x + 5} \, dx$$

16. Evaluate the indefinite integral.

$$\int \frac{6 + 6x}{\sqrt{7 + 6x + 3x^2}} \, dx$$

17. Evaluate the integral if it exists.

$$\int_0^1 6x^2 \cos(x^3) \, dx$$

18. Find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the indicated axis.

$$y = x^2, y = 0, x = 3, x = 5; \text{ the } x\text{-axis}$$

19. Determine whether the improper integral converges or diverges, and if it converges, find its value.

$$\int_{\pi/2}^{5\pi/6} \frac{\cos x}{\sqrt{1 - \sin x}} \, dx$$

20. Write the first five terms of the sequence  $\{a_n\}$  whose  $n^{\text{th}}$  term is given.

$$a_n = \frac{n+7}{6n-1}$$

21. Find an expression for the  $n^{\text{th}}$  term of the sequence. (Assume that the pattern continues.)

$$\left\{ \frac{2}{25}, \frac{4}{36}, \frac{6}{49}, \frac{8}{64}, \frac{10}{81}, \dots \right\}$$

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**Answer Section**

1. ANS:  $\frac{1}{3}$  Section 7.8

2. ANS:  $a_n = \frac{(-1)^n n^4}{n+1}$  Section 11.1

3. ANS:  $\frac{1}{6}$  Section 11.1

4. ANS:  $\frac{1}{18}$  Section 7.8

5. ANS:  $\frac{\pi\sqrt{3}}{2}$  Section 7.8

6. ANS:  $\int_{-\infty}^0 \frac{10}{x^2+9} dx$  Section 7.8

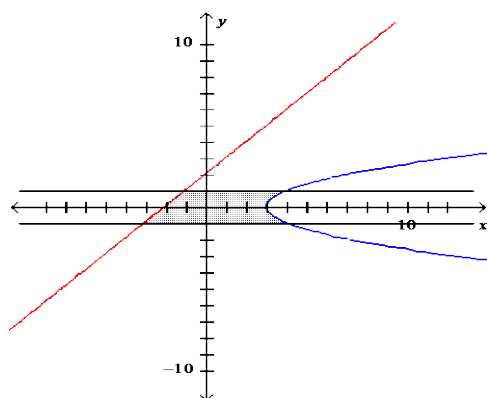
7. ANS:  $\frac{16}{35} \pi$  Section 6.2

8. ANS:  $\frac{1088}{15} \pi$  Section 6.2

9. ANS:  $\frac{89}{84} \pi$  Section 6.2

10. ANS:  $\frac{7}{6}$  Section 6.1

11. ANS:



$\frac{32}{3}$

Section 6.1

12. ANS:  $-\frac{1}{7} \cos^7 x + C$  Section 5.5

13. ANS:  $-7e^{\cos x} + C$  Section 5.5

14. ANS:  $\frac{2}{9} \left( x^3 + 2 \right)^{3/2} + C$  Section 5.5
15. ANS:  $\ln \left( e^x + 5 \right) + C$  Section 5.5
16. ANS:  $2\sqrt{7 + 6x + 3x^2} + C$  Section 5.5
17. ANS:  $2\sin(1)$  Section 5.5
18. ANS:  $\frac{2882}{5} \pi$  Section 6.2
19. ANS:  $-\sqrt{2}$  Section 7.8
20. ANS:  $\frac{8}{5}, \frac{9}{11}, \frac{10}{17}, \frac{11}{23}, \frac{12}{29}$  Section 11.1
21. ANS:  $\alpha_n = \frac{2n}{(n+4)^2}$  Section 11.1