

## Review Problems for Final

Sections to be covered: **everything** in the course syllabus

Review Session: Thursday, May 4, 6:30-8:30pm, in Harriman Hall 137

Final Exam: May 15, 2:00- 4:30 pm , in Javits 102

1. Differentiate the following functions:

(a)  $f(x) = x^6 + 12x^3 - 4x + \pi$

(b)  $f(x) = \sqrt{x} + \frac{7}{x}$

(c)  $f(x) = 2^x$

(d)  $f(x) = e^{-x} + e^{x^2}$

(e)  $f(x) = x \ln(x)$

(f)  $f(x) = (1 + \ln x)^2$

(g)  $f(x) = (x^2 - 3x + 1)(x^3 - 27)$

(h)  $f(x) = \frac{x+2}{x^3-x+1}$

2. Find the second derivative of the following functions:

(a)  $f(x) = x^2 + 6$

(b)  $f(t) = (1 + x^3)^2$

3. Find some anti-derivative of the given function:

(a)  $f(x) = x^{-4}$

(b)  $f(x) = e^{-x}$

(c)  $f(x) = \frac{3}{x}$

(d)  $f(x) = 5x^5(3 + x^6)$

(e)  $f(x) = \frac{e^x}{3+e^x}$

(f)  $f(x) = \frac{2x}{1+x^2}$

4. Use the Fundamental Theorem of Calculus to evaluate the integral:

(a)  $\int_0^1 (x^4 + 2x - 1)dx =$

(b)  $\int_0^2 xe^{x^2} dx =$

5. For the function  $y = 1 + x^2, 0 \leq x \leq 2$ :

(a) Graph the function:

(b) On the graph, draw the rectangles whose total area is the left sum for  $\int_0^2 (1 + x^2)dx$ , with 4 subdivisions;

(c) Compute the left sum for 4 subdivisions;

(d) Compute  $\int_0^2 (1 + x^2)dx$  using an antiderivative.

6. Problem 10 page 224.

7. For the curves  $y = 2x, y = 3 - x^2$ :

(a) Graph the two curves and find their points of intersection:

(b) Find the area of the region between the two curves.

8. Problem 8, 12 page 246.

9. Problem 32 page 290.
10. I want to make a rectangular picture frame out of metal strips. The strips along the top and bottom cost \$2 per inch, the strips along the two sides cost \$3 per inch. What is the largest area that I can frame for \$100?
11. Problems 1 – 4 page 104.
12. Problems 7, 9 page 175.
13. A particle's position on the  $y$ -axis is given by:

$$y = f(t) = 3t^2 + 24t - t^3, \quad -3 \leq t \leq 5$$

- (a) Find the average velocity from  $t = 0$  to  $t = 2$ .
- (b) Find the velocity at time  $t$ .
- (c) When does the particle stop momentarily?
- (d) On what time intervals is the velocity positive?
- (e) On what time intervals is the velocity increasing?
- (f) What is the maximum distance from the origin that is reached by the particle?
14. Problem 12, 19 page 180.