

CHAOS – SPRING SEMESTER FINAL REVIEW

4.1 In the following exercises, find the integral.

17.  $\int (2x - 3x^2) dx$

29.  $\int (x+1)(3x-2) dx$

30.  $\int (2t^2 - 1)^2 dt$

34.  $\int \frac{1}{x^6} dx$

36.  $\int (t^2 - \sin t) dt$

In the following exercises, solve the differential equation.

57.  $h'(t) = 8t^3 + 5, h(1) = -4$

58.  $f''(x) = 6, f'(2) = 12, f(2) = 22$

**HW 4.3**

Evaluate the following definite integrals.

1.  $\int_1^2 \frac{dx}{x^4}$

2.  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} 2 \cos \theta d\theta$

Find the area under the graph  $f$  from  $a$  to  $b$

3.  $f(x) = -x^3 + 2x^2; a = -2, b = 1$

**HW 4.4**

Evaluate the definite integral of the algebraic function.

4.  $\int_{-3}^3 v^{2/3} dv$

14.  $\int_{-3}^0 4 - |2x + 3| dx$

75.  $\int_0^4 \frac{1}{\sqrt{2x+1}} dx$

28.  $\int_0^{\frac{\pi}{6}} \frac{1 - \sin^2 \theta}{\cos^2 \theta} d\theta$

23.  $\int_0^3 (|2x - 3|) dx$

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Find the average value of the function over the given interval and all values of  $x$  in the interval for which the function equals its average value.

47.  $f(x) = 4 - x^2$   $[-2, 2]$

Find  $F$  as a function of  $x$  and evaluate it at  $x=2$ ,  $x=5$  and  $x=8$ .

69.  $F(x) = \int_1^x \frac{10}{v^2} dv$

In the following exercises a) integrate to find  $F$  as a function of  $x$  and b) demonstrate the Second Fundamental Theorem of Calculus by differentiating the result in part a).

76.  $F(x) = \int_0^x t(t^2 + 1) dt$

77.  $F(x) = \int_8^x \sqrt[3]{t} dt$

Use the Second Fundamental Theorem of Calculus to find  $F'(x)$ .

84.  $F(x) = \int_1^x \sqrt[4]{t} dt$

85.  $F(x) = \int_0^x t \cos t dt$

Find the indefinite integral.

9.  $\int \sqrt{9 - x^2} (-2x) dx$

45.  $\int \sin 2x dx$

15.  $\int t\sqrt{t^2 + 2} dt$

48.  $\int x \sin x^2 dx$

24.  $\int \frac{x^3}{\sqrt{1 + x^4}} dx$

54.  $\int \frac{\sin x}{\cos^3 x} dx$

27.  $\int \frac{1}{\sqrt{2x}} dx$

Find the derivative of the function.

1.  $f(x) = \ln\left(\frac{x^3 \sqrt{x-2}}{\sqrt{4x^5}}\right)$

Find the equation of the tangent line to the graph of  $f$  at the given point.

2.  $f(x) = 5x^4 - \ln x$   $(1, 5)$

Use logarithmic differentiation to find  $\frac{dy}{dx}$

3.  $y = \frac{2x(x-1)^{1/2}}{\sqrt{x+1}}$

Find the indefinite integral.

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4.  $\int \frac{x}{5-3x^2} dx$

5.  $\int \frac{2x^5 + x^3 + 6}{3x} dx$

Find the indefinite integral by u-substitution. (Hint: Let u be the denominator of the integrand)

6.  $\int \frac{x^2}{\sqrt{3-x^3}} dx$

Evaluate the integral.

7.  $\int \frac{5}{(x-1)(x+4)} dx$

8.  $\int \frac{2x+1}{x^2+x-2} dx$

**Find the derivative**

9.  $f(x) = 3e^{5\sqrt{x}}$

10.  $y = \ln(3 + e^{8x})$

Find the integral or evaluate the definite integral.

11.  $\int \frac{e^x + 7}{e^x} dx$

12.  $\int \frac{6x^2 + 6}{(x^3 + 3x)^2} dx$

Solve the equation accurate to three decimal places.

21.  $3^{2x} = 75$

25.  $\left(1 + \frac{.09}{12}\right)^{12t} = 3$

29.  $\log_3 x^2 = 4.5$

Find the derivative of the function.

22.  $g(t) = 2^{6t}$

41.  $g(\alpha) = 2^{-\alpha} \cos \pi\alpha$

44.  $y = \log_3 \frac{x\sqrt{x-1}}{2}$

Evaluate the integrals and definite integrals.

65.  $\int \frac{3^{2x}}{1+3^{2x}} dx$

67.  $\int_{-1}^2 2^x dx$

Sketch the region bounded by the graphs of the equations, and determine the area of the region.

21.(7.1)  $f(x) = x^2 + 2x + 1$ ,  $g(x) = 3x + 3$

29.(7.1)  $f(y) = y^2 + 1$ ,  $g(y) = 0$ ,  $y = -1$ ,  $y = 2$

Sketch the region bounded by the graphs of the equations, and determine the area of the region.

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5.(7R)  $y = x, y = x^3$

9.(7R)  $y = \sin x, y = \cos x, \frac{\pi}{4} \leq x \leq \frac{5\pi}{4}$

Find the volume of the solid generated by revolving the plane region bounded by the equations about the indicated line(s).

6.  $y = x^2, y = x^3$  rotated about the x-axis.

14.  $y = 6 - 2x - x^2, y = x + 6$   
a) the x-axis    b) the line  $y = 3$

21.(7R)  $y = x, y = 0, x = 4$   
a) the line  $x = 4$     b) the line  $x = 6$

32. The region under the curve of  $y = \frac{1}{x}$  from  $x = 1$  to  $x = 3$  is revolved about the  $x$ -axis. Find the volume of the solid formed.

62. Find the volume of the solid whose base is bounded by the graphs of  $y = x + 6$  and  $y = x^2 - 6$  with the indicated cross sections taken perpendicular to the x-axis.  
a) Squares    b) Rectangles of height 1