

# Review problems for Exam #3

Math 1100, Fall 2005

(1) Find the indefinite integrals and evaluate the definite integrals:

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

(b)  $\int \frac{x^2}{x^3 + 1} dx.$

(c)  $\int 5x^3 e^{x^4-1} dx.$

(d)  $\int 5\sqrt{t} - \frac{3}{t} + \frac{4}{t^3} dt.$

(e)  $\int \frac{4}{e^{2x}} dx.$

(f)  $\int_2^{10} \frac{3}{\sqrt{5x-1}} dx.$

(g)  $\int_0^1 (2x^2 - 3)^4 x dx.$

(h)  $\int \frac{v^2 + v}{1 - 3v^2 - 2v^3} dv.$

(i)  $\int_1^2 \left(1 + \frac{1}{w}\right)^2 \frac{1}{w^2} dw.$

(j)  $\int \frac{1}{x(\ln x)^2} dx.$

(k)  $\int_0^{\ln 2} \frac{e^x}{1 + e^x} dx.$

(l)  $\int_{-3}^1 |x - 2| dx.$

(2) Use the definite integral to find the area of the region bounded by the given curve, the  $x$ -axis, and the given vertical lines.

(a)  $y = \frac{1}{x}$ ,  $x = 1$  and  $x = e$ .

(b)  $y = 4 + 3x - x^2$ .

(c)  $y = x^3 + 3x^2$ ,  $x = -2$ , and  $x = 2$ .

(d)  $y = e^x$ ,  $x = 1$ , and  $x = 3$ .

(3) Use the definite integral to find the area of the region bounded by the given curves.

(a)  $y = x^2$  and  $y = 2x$ .

(b)  $y = x - 4$  and  $y^2 = 2x$ .

(c)  $x + 5y = 6$  and  $y = \frac{1}{x}$ .

(d)  $y = \sqrt{x}$  and  $y = x^2$ .

(4) Find the equation of the function  $f$  whose graph passes through the point  $(2, 2)$ , if  $f' = \frac{x^2 + 2x + 5}{x - 1}$ .

(5) You deposit \$500 in a saving account each year for 20 years at an interest rate of 9%. How much you will have in your account after 20 years ?

(6) Show that the function  $f(x) = x^2 + |x|$  is even and then compute  $\int_{-2}^2 x^2 + |x| dx$ .

- (7) Find the change in profit if the marginal profit is given by  $\frac{dP}{dx} = \frac{200 - x}{50}$  and the number of units increases by 4 from  $x = 100$
- (8) Find the consumer surplus and the producer surplus if the demand function is  $p_2(x) = 500 - x$  and the supply function is  $p_1(x) = 1.25x + 162.5$ .
- (9) Find the indefinite integrals and evaluate the definite integrals:
- $\int_0^1 \frac{x}{(x+4)^4} dx.$
  - $\int_0^1 x\sqrt[3]{1-x} dx.$
  - $\int xe^{4x} dx.$
  - $\int \frac{x}{e^x} dx.$
  - $\int x^4 \ln x dx.$
  - $\int_1^e x(\ln x)^2 dx.$
  - $\int x\sqrt{x+2} dx.$
- (10) A company expects its income  $c$  during the next 4 years to be modeled by  $c(t) = 150,000 + 75,000t$ .
- Find the actual income for the business over 4 years.
  - Assuming an annual inflation rate of 4%, what is the present value of this income?
- (11) Find the indefinite integrals:
- $\int \frac{2}{1-x^2} dx.$
  - $\int \frac{1}{3x^2+x} dx.$
  - $\int \frac{x+1}{3(x-2)^2} dx.$
  - $\int \frac{x^2-x}{x^2+x+1} dx.$