AMS 11B

Study Guide 4

More definite integrals and more applications

1. What are the *Producers' surplus* and *Consumers' surplus* for the market with supply function

$$p = 0.05q^2 + 3q + 5$$

and demand function

$$p = 100 - 0.75q.$$

- **2.** Find the average value of the function $f(x) = \frac{x^4 1}{x^2}$ on the interval [1,3].
- **3.** Use the table of integral formulas in Appendix B in the textbook to help compute the integrals below.

(a)
$$\int \frac{4 \, dx}{5x\sqrt{x^2 + 9}} =$$

(b) $\int \frac{2e^{2x} \, dx}{\sqrt{9 + 4e^x}} =$
(c) $\int_0^{10} 200t^2 e^{-0.06t} \, dt =$
(d) $\int_0^3 \frac{2 \, dv}{\sqrt{v^2 + 16}} =$
(e) $\int 5x^3 \ln x \, dx =$
(f) $\int_0^2 \frac{3 + 5x}{2 + 7x} \, dx =$

Hints: (b) Start with the substitution $u = e^x$ (and remember that $e^{2x} = (e^x)^2$). (f) Write the integrand as a sum of two simpler terms.

- 4. Compute the present value of the continuous annuity that pays at the continuous rate f(t) = 250t for T = 20 years, where the constant interest rate is r = 4.75%.
- 5. Let y = f(x) satisfy (i) $\frac{dy}{dx} = 3xy^2$ and (ii) y(1) = 2. Find the function f(x).