

## Review Questions 4

## Applications of definite integrals to economics

1. Compute the following integrals. Use the table of integrals in Appendix C.

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

d.  $\int \frac{3 dv}{\sqrt{4v^2 + 25}} =$

b.  $\int_0^4 \frac{2x dx}{\sqrt{9 + 4x}} =$

e.  $\int 5x^3 \ln x dx =$

c.  $\int_0^{10} 200t^2 e^{-0.06t} dt =$

f.  $\int_0^2 \frac{3 + 5x}{2 + 7x} dx =$

2. Compute the producers' and consumers' surplus at equilibrium for the market with the supply and demand equations:

$$\text{supply: } p = 0.1q + 5; \quad \text{demand: } p = 40 - \frac{q}{10} - \frac{q^2}{100}.$$

3. Compute the Gini coefficient (of inequality) for the nation whose income distribution curve is given by  $y = 0.3x^3 + 0.2x^2 + 0.5x$ .

4. Compute the present value of the continuous annuity that pays at the rate  $f(t) = 250t$  for  $T = 20$  years, where the constant interest rate is  $r = 4.75\%$ .

5. A firm's cost function is given by  $c = 0.05q^2 + 35q + 12000$ . Compute the average value of this cost function on the interval  $[0, 100]$ . Is this the same as the *average cost of producing 100 units*?

6. Consider the sum

$$\sum_{k=1}^{500} 0.4k \cdot e^{-0.0019k}.$$

- Use the formula from problem 7. in the exercises of SN 1 to compute its value.
- Compare your answer to the answer you found in problem 4., above.
- Explain the results.