

MATH 103 200710 Problem Set 9

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The following problems should help you study for the final exam on Saturday, April 21, 2007.

1. Evaluate each of the following indefinite integrals (antiderivatives):

(a) $\int \left(2x^2 - \frac{1}{3x}\right) dx$ (b) $\int e^{-x} dx$ (c) $\int -2(e^{2x} + 1) dx$ (d) $\int x\sqrt{x} dx$

2. Evaluate each of the following definite integrals.

(a) $\int_0^1 (4x^3 - 1) dx$ (b) $\int_1^4 4e^{-3x} dx$ (c) $\int_3^6 x^{-1} dx$ (d) $\int_0^1 \sqrt{e^x} dx$

3. Find the areas of the following regions.

- (a) The area between $y = 3x^2$ and the x -axis from $x = -1$ to $x = 1$
- (b) The area between $y = e^{x/3}$ and the x -axis from $x = 1$ to $x = 2$
- (c) The area between $y = \sqrt{x}$ and the x -axis from $x = 0$ to $x = 9$
- (d) The area between $y = x^2 - 4x + 5$ and the x -axis from $x = -2$ to $x = 2$

4. Evaluate the following indefinite integrals by substitution.

(a) $\int (2x - 1)^7 dx$ (b) $\int xe^{-x^2} dx$ (c) $\int e^x \sqrt{1 + e^x} dx$ (d) $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

5. Find the following integrals.

(a) $\int_0^4 \frac{1}{\sqrt{2x+1}} dx$ (b) $\int \frac{(\ln x)^5}{x} dx$ (c) $\int x\sqrt{4-x^2} dx$ (d) $\int_e^{e^2} \frac{\ln \sqrt{x}}{x} dx$

6. Find the areas of the following regions.

- (a) The region between $y = x^2 + 1$ and $y = -x^2 - 1$ from $x = -1$ to $x = 1$
- (b) The region bounded by $y = x^2$ and $y = x$
- (c) The region bounded by $y = 8x^2$ and $y = \sqrt{x}$
- (d) The region bounded by $y = x^2 + 4$ and $y = 4x + 1$

7. The marginal profit for a certain company is $MP_1(x) = -x^2 + 14x - 24$. The company expects the daily production level to rise from $x = 6$ to $x = 8$ units. Management is considering a plan that would have the effect of changing the marginal profit to $MP_2(x) = -x^2 + 12x - 20$. Should the company adopt the plan? Hint: Determine the area between the graphs of the two marginal profit functions from $x = 6$ to $x = 8$. Interpret this area in economic terms.

Please do the following problems from the textbook. They may appear on the final exam.

6.1 C-level: 1–40; B-level: 41–50; A-level: 51–54, 57–58, 61–65.

6.3 C-level: 1–34; B-level: 35–38; A-level: 40–44, 47–50.

6.4 C-level: 5–18; B-level: 19–23; A-level: 24–27.

9.1 C-level: 1–18; B-level: 19–34; A-level: 35–40, 53.