Business Calculus I (Math 221) Exam 3

Date: December 4, 2013 $\qquad$ Professor Ilya Kofman

Justify answers and show all work for full credit.

NAME: _____

Problem 1. Evaluate

(a) $\displaystyle\int \left(\frac{4}{t^2} + 3e^{9t} - \frac{2}{t} \right) \, dt$

(b) $\displaystyle\int \left(-5x^3 + 7\sqrt{x} + \frac{1}{\sqrt[3]{x}} \right) \, dx$

(c) $\displaystyle\int \frac{x^4}{\sqrt{3x^5 + 6}} \, dx$

Problem 2. If $\displaystyle\int f(x) \, dx = 4x^3 - 2x^{3/2} + 3e^x + C$, find $f(x)$.

Problem 3. Evaluate

(a) $\displaystyle\int_{-10}^{10} x^5 \; dx$

(b) $\displaystyle\int_{-2}^{2} (9x^2 - 4x + 3) \; dx$

(c) $\displaystyle\int_{1}^{2} (2t - 3)^{10} \; dt$

(d) $\displaystyle\int_{0}^{1} x^2 e^{x^3} \; dx$

Problem 4. Express the shaded signed area under the given curve as an integral. Then evaluate the integral to find the signed shaded area under the curve.

$$y = -x^3 - 2\,x^2 + 15\,x$$
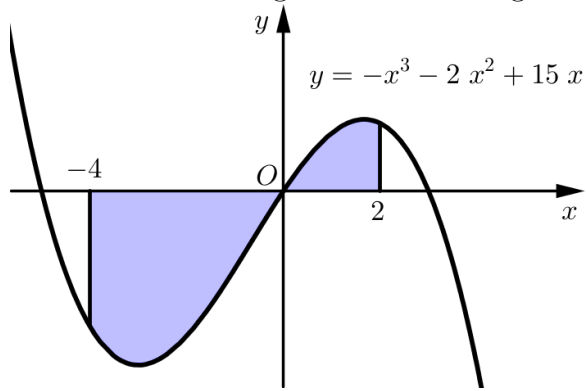
Bonus: Find the total (unsigned) shaded area bounded by the curve and the x–axis.

Problem 5. Find the total income over the next 5 years from a continuous income stream with annual flow rate $f(t) = 150\,e^{-0.2t}$.

Problem 6. The rate of increase in maintenance costs for a building is
$M'(t) = \dfrac{1000}{\sqrt{t+7}}$, where M is in dollars and t is in years.
Find the total maintenance cost for years 2 through 9, i.e. for $2 \leq t \leq 9$.

Problem 7. To produce x fenleys, the marginal cost in dollars is $\overline{MC} = 5x + 20$, and the marginal revenue is $\overline{MR} = 150 - 3x$. The fixed cost is \$2500.

(a) Find the marginal profit function $\overline{MP}(x)$, where x is the number of fenleys.

(b) Find the profit function $P(x)$ for fenleys.

(c) Find the profit when 100 fenleys are sold.