

MAT 210 Exam 3 Review Questions

Indefinite Integral (Section 13.1)

- Find the indefinite integrals.
 - $\int 2x^4 - 4x^{-2} + 5x^{-5} + 3 dx$
 - $\int \frac{7}{x} + \frac{1}{3x^7} dx$
 - $\int \frac{2}{x^2} - 5\sqrt{x} dx$
 - $\int e^x - x^{-0.3} dx$
 - $\int (x+3)(x-2) dx$
 - $\int \frac{x^2+5x-2}{x} dx$
- Find $f(x)$ if $f(0) = -1$ and the derivative $f'(x) = 9e^x + 9$.
- The velocity of a particle moving in a straight line is $v(t) = t^2 + 6$. Find the expression for the position, $s(t)$, of the particle at time t , if $s(3) = 0$.
- Suppose the function $C(x)$ gives the total cost (in dollars) of producing x units of a certain product. The marginal cost of producing the x th unit is $C'(x) = 0.5x + \frac{1}{x}$. If the cost to produce the first unit is 5 dollars, find the cost function $C(x)$.

Substitution (Section 13.2)

- Use integration by substitution to find the integrals.
 - $\int 16e^{-3x} dx$ (can also use short-cut formula)
 - $\int (5x-2)^3 dx$ (can also use short-cut formula)
 - $\int \frac{1}{2x-5} dx$ (can also use short-cut formula)
 - $\int 4xe^{x^2-3} dx$
 - $\int x(x^2+1)^{10} dx$
 - $\int 15x\sqrt{-x^2+7} dx$
 - $\int (3x^2+1)(x^3+x-2)^9 dx$
 - $\int \frac{3 \ln x}{x} dx$

Fundamental Theorem of Calculus; Definite Integral; Left Riemann Sum (Sections 13.3, 13.4)

1. Evaluate the definite integrals by using the fundamental Theorem of Calculus. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.

(a) $\int_0^1 (6x^5 + 15x^4 - 9x^2 + 1) dx$

(b) $\int_2^7 \left(x + \frac{5}{x}\right) dx$

(c) $\int_1^{10} \frac{1}{x^2} dx$

(d) $\int_0^6 e^{-x+6} dx$

(e) $\int_{-1}^1 5e^{3x} dx$

(f) $\int_{e^3}^{e^5} \frac{2}{x} dx$

(g) $\int_{\ln 3}^{\ln 5} e^{2x} dx$

2. Assume that b is a positive number, solve the following equation for b .

$$\int_2^b (2x - 4) dx = 9$$

3. Calculate the left Riemann sum for the function $f(x) = 3x^2 + 2x - 3$ over the interval $[1, 3]$, with $n = 5$.
4. Use a left Riemann sum to estimate the definite integral with $n = 4$ subintervals.

$$\int_2^3 \frac{1}{1 + 2x} dx$$

Applications of Definite Integrals (Section 13.4)

1. A particle moves in a straight line with velocity $v(t) = -t^2 + 8$ meters per second, where t is time in seconds. Find the displacement of the particle between $t = 2$ and $t = 6$ seconds. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.
2. The marginal revenue of the x th box of flash cards sold is $500e^{-0.001x}$ dollars. Find the revenue generated by selling box 101 through 5,000. Show all your work step by step. **Give the exact value first; then round your answer to 2 decimal places.** Only use your calculator to round your answer.
3. Since YouTube first became available to the public in mid-2005, the rate at which video has been uploaded to this site can be approximated by $f(t) = 1.1t^2 - 2.6t + 2.3$ million hours of videos per year ($0 \leq t \leq 9$), where t is time in years since June 2005. Use a definite integral to estimate the total number of hours of video uploaded from June 2007 to June 2010. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.
4. Calculate the area of the region bounded by $y = \sqrt{x}$, the x -axis, and the lines $x = 0$ and $x = 16$. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.

Area between Curves (Section 14.2)

1. Find the area of the region enclosed by the curves of $y = -x^2 + 6x + 2$ and $y = 2x^2 + 9x - 4$. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.
2. Find the area of the region enclosed by the curves of $f(x) = x^2 - x + 5$ and $g(x) = x + 8$. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.
3. Find the area of the region between $y = x^2$ and $y = -1$ from $x = -1$ and $x = 1$. Show all your work step by step. **Give the exact value.** You may use your calculator to check your final answer only.
4. Which of the following calculates the area of the region(s) between the curves $y = x^2$ and $y = 1$ from $x = -1$ to $x = 2$?

A. $\int_{-1}^2 (x^2 - 1) dx$

B. $\int_{-1}^2 (1 - x^2) dx$

C. $\int_{-1}^1 (1 - x^2) dx + \int_1^2 (x^2 - 1) dx$

D. $\int_{-1}^1 (x^2 - 1) dx + \int_1^2 (1 - x^2) dx$

E. None of the above.

