Math 141
exam 3
misc.
fall 2010

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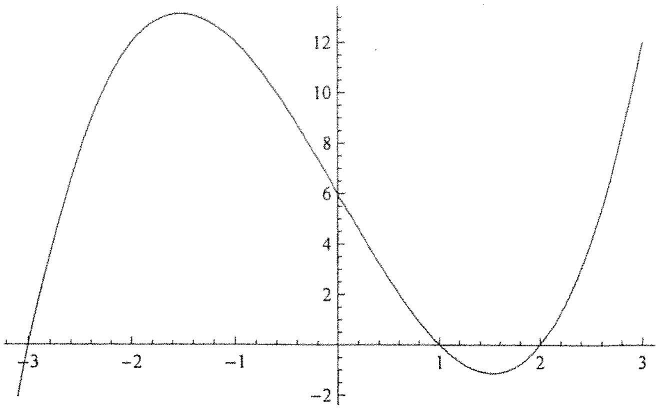
Exam III - Math 141 Fall 2010

Name: [redacted]

Exam Version C

This exam is multiple choice. Make sure you fill in your answers on the scantron answer sheet provided. Fill in your name, student ID number, and the exam version on the scantron answer sheet. You may use this exam, and the blank pages provided, to work out the problems. You must hand in this exam as well as the scantron answer sheet. To hand in your exam, be prepared to show your picture ID. This is a closed book, closed notes exam. Calculators are allowed but must be equivalent to a TI-83/84; no TI-89s or equivalent are allowed. No cell phones are permitted outside of your bag at anytime during the test.

Use the following graph of $f(x)$ to answer questions 1 through 3:



1. The value of $\int_{-3}^{1} f(x)dx$ is
   (a) Negative
   (b) Positive
   (c) Zero
   (d) Cannot be determined

2. The value of $\int_{1}^{2} f(x)dx$ is
   (a) Negative
   (b) Positive
   (c) Zero
   (d) Cannot be determined

3. The value of $\int_{-3}^{2} f(x)dx$ is
   (a) Negative
   (b) Positive
   (c) Zero
   (d) Cannot be determined

4. If $\int_5^7 f(x)dx = 2$ and $\int_5^7 g(x)dx = -5$, then the value of $\int_5^7 (2f(x) - g(x))\, dx$ is

$2\int_5^7 2 - \int_5^7 -5$

$4 + +5$

(a) 9

(b) 13

(c) -1

(d) 7

(e) Cannot be determined

5. Find $f'(x)$ for $f(x) = \ln(5x^2 + 2x - 1) + e^{6x}$

(a) $f'(x) = \dfrac{10x+2}{5x^2+2x-1} + 6e^{6x}$

(b) $f'(x) = \dfrac{1}{5x^2+2x-1} + e^{6x}$

(c) $f'(x) = \dfrac{1}{5x^2+2x-1} + 6e^{6x}$

(d) $f'(x) = \dfrac{10x+2}{5x^2+2x-1} + e^{6x}$

6. Find $g'(x)$ for $g(x) = e^{-3x}\ln(x)$

(a) $g'(x) = \dfrac{e^{-3x}}{\ln(x)} + e^{-3x}\ln(x)$

$(-3)e^{-3x} \quad \frac{1}{x} \qquad e^{-3x}\ln x$

(b) $g'(x) = \dfrac{e^{-3x}}{x} - 3e^{-3x}\ln(x)$

-3

(c) $g'(x) = \dfrac{e^{-3x}}{\ln(x)} - 3e^{-3x}\ln(x)$

(d) $g'(x) = \dfrac{e^{-3x}}{x} + e^{-3x}\ln(x)$

7. Find the ***exact*** value of $\int_1^2 \left(3x^2 - \dfrac{1}{x} + e^{2x}\right) dx$ is

(a) $e^4 - e^2 + \frac{19}{2}$

(b) $e^4 + e^2 + \frac{19}{2}$

(c) $\frac{1}{2}e^4 - \frac{1}{2}e^2 - \ln(2) + 7$

(d) $7 - \ln(2)$

$x^3 - \ln x + \frac{1e^{2x}}{2}$

$x^3 - \ln x + \frac{1}{2}e^{2x}$

$\left((2)^3 - \ln(2) + \frac{1}{2}e^{2(2)}\right) - (1)^3 + \frac{1}{1} - \frac{1}{2}e^2$

8. Find the ***exact*** value of $\int_0^4 \left(e^{x/4} + 1\right) dx$ is

(a) $e + 1$

(b) $4e + 4$

(c) $4e$

(d) e

$\frac{4e^{\frac{1}{4}x} + x}{\frac{1}{4}}$

$4e^{(x/4)} + x$

$4e + x$

$4e$

9. Evaluate $\int_a^b \left(\frac{1}{x} - 6e^{3x}\right) dx$, where a and b are positive real numbers.

(a) $\ln(b) - 2e^{3b} - ln(a) + 2e^{3a}$

(b) $\ln(b) - 2e^{3b} - ln(a) - 6e^{3a}$

(c) $\ln(b) - 2e^{3b} - ln(a) + 6e^{3a}$

(d) $\ln(b) - 2e^{3b} - ln(a) - 2e^{3a}$

$\ln x - \frac{6e^{3x}}{3}$

$(\ln x - 2e^{3x}) - (\ln - 2e^{3x})$

$-\ln + 2$

10. Find $f(x)$ given $f'(x) = 6x^2 - 2x$ and $f(1) = 3$.

(a) $f(x) = 2x^3 - x^2 + 1$

(b) $f(x) = 2x^3 - x^2 + C$

(c) $f(x) = 2x^3 - x^2 + 3$

(d) $f(x) = 2x^3 - x^2 + 2$

$\frac{6x^3}{3} - \frac{2x^2}{2}$

$2x^3 - x^2 + C$

$2(1)^3 - (1)^2 + c = 3$

$2 - 1 + c = 3$

$1 + c = 3$

$2 = c$

11. Evaluate $\int \left(\sqrt{x} + \frac{2}{x^2} + 3x^5\right) dx.$

(a) $\frac{2}{3}x^{3/2} + 2\ln(x^2) + \frac{1}{2}x^6 + C$

(b) $\frac{2}{3}x^{3/2} - \frac{2}{x} + \frac{1}{2}x^6 + C$

(c) $x^{3/2} - \frac{2}{x} + \frac{1}{2}x^6 + C$

(d) $\frac{1}{2}x^{-1/2} - \frac{4}{x^3} + 15x^4 + C$

$x^{1/2} + 2x^{-2} + 3x^5$

$\frac{x^{3/2}}{3/2} + \frac{2x^{-1}}{-1} + \frac{3x^6}{6}$

-2

$\frac{2}{3}x^{3/2} + \frac{2}{x} + \frac{1}{2}x^6$

12. Evaluate $\int \left(4\sqrt[3]{x} + \frac{5}{x} + e^x - 100\right) dx$, where $x > 0$.

(a) $12x^{4/3} + 5x^{-2} + e^x - 100x + C$

(b) $4x^{1/3} + 5\ln(x) + e^x - 100 + C$

(c) $3x^{2/3} + 5\ln(x) + e^x - 100x + C$

(d) $3x^{4/3} + 5\ln(x) + e^x - 100x + C$

$\frac{3}{\cancel{4}}\cancel{4}\frac{x^{4/3}}{4/3} + 5\ln|x| + e^x - 100x$

13. Find the area between the graph of $y = 5x^4 + 3$ and the x-axis over the interval $[-1, 2]$.

(a) 14.8

(b) 42

(c) 34

(d) 38

(e) None of the above

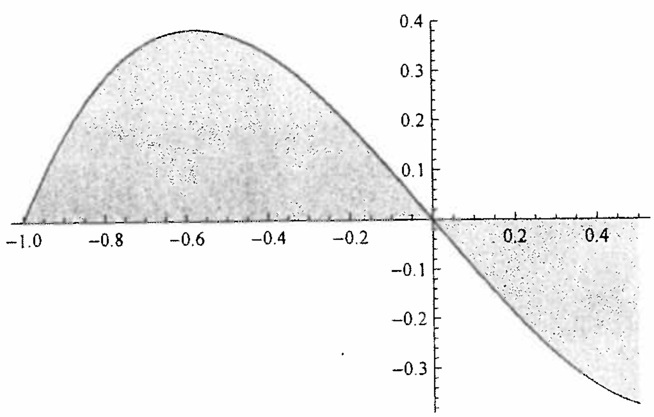
$\int_{-1}^{2} 5x^4 + 3$ $\qquad \frac{5x^5}{5} + 3x$

$x^5 + 3x$

$\left((2)^5 + 3(2)\right) - \left((-1)^5 + 3(-1)\right)$

$32 + 6 \quad 38 - (-1 + 3) \quad -4$

14. Find the area of the shaded region between the graph of $y = x^3 - x$ and the x-axis between $x = -1$ and $x = 0.5$ to three decimal places.



(a) −0.109

(b) 0.109

(c) 0.141

(d) 0.250

(e) 0.359

$\int_{-1}^{.5} x^3 - x$ $\qquad \int_{0}^{.5} \frac{1}{4}(.5)^4 - \frac{1}{2}(.5)^2$

$\int_{-1}^{0} \frac{1}{4}x^4 - \frac{1}{2}x^2$

$0 - \left(\frac{1}{4}(-1)^4 - \frac{1}{2}(-1)^2\right)$

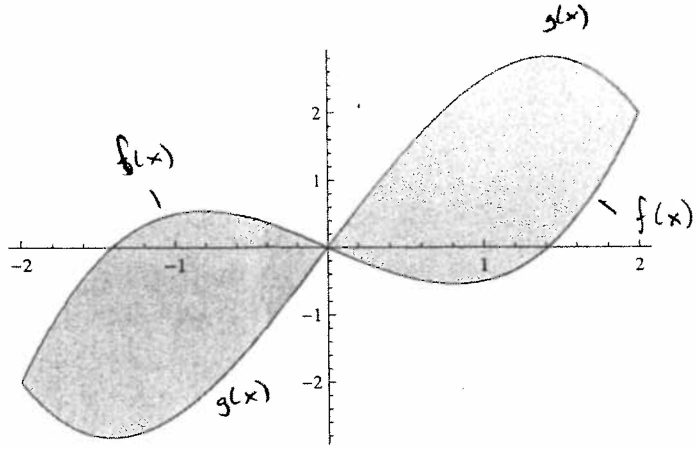
$.25 - .5$

$.25$

15. Find the area of the shaded region bounded by the curves

$$f(x) = \frac{1}{2}x^3 - x$$
$$g(x) = -\frac{1}{2}x^3 + 3x$$

$-\frac{1}{2}$



(a) 16

(b) 0

(c) 8

(d) 12

$(\frac{1}{2}x^3 - x) - (\frac{1}{2}x^3 + 3x)$

$\frac{1}{2}x^3 - x + \frac{1}{2}x^3 - 3x$

$\int_{-2}^{0} x^3 - 4x$ $\quad 0 - ((-2)^3 - 4(-2))$

$-8 + 8$

16. Find the area of the region bounded by the curves $y = 4x + 5$ and $y = x^2$.

(a) 36

(b) 24

(c) 30

(d) $\frac{100}{3}$

(e) Cannot be determined from information given.

$\int_{-1}^{5} x^2 - 4x - 5$ $\quad 4x+5 = x^2$

$\frac{1}{3}x^3 - 2x^2 - 5x$ $\quad x^2 - 4x - 5$

$(\frac{1}{3}(5)^3 - 2(5)^2 - 5(5)) - (\frac{1}{3}(-1)^3 - 2(-1)^2 - 5(-1))$ $\quad (x-5)(x+1)$

$-33-$

$5, -1$

17. Which of the following choices of u will help you evaluate the antiderivative below using u-substitution?

$$\int (x^7 + 8x^2 + e^x)^4 (7x^6 + 16x + e^x)dx$$

(a) $u = 7x^6 + 16x + e^x$

(b) $u = x^7$

(c) $u = e^x$

(d) $u = x^7 + 8x^2 + e^x$

18. Find the following antiderivative:

$$\int e^{x^3+4}\, x^2 dx$$

(a) $\frac{1}{3}e^{x^3+4}\, x^3 + C$

(b) $e^{x^3+4} + C$

(c) $3e^{x^3+4} + C$

(d) $\frac{1}{3}e^{x^3+4} + C$

(e) None of the above.

x^3+4

$\frac{dx\, 3x^2}{3} = \frac{du}{3}$

$\frac{1}{3}du$

$\frac{1}{3}\int e^{x^3+4}$

19. Find the following antiderivative:

$$\int \frac{(\ln x)^2}{x} dx$$

(a) $\frac{2\ln x - (\ln x)^2}{x^2} + C$

(b) $(\ln x)^3 x^2 + C$ $\quad \ln^2 x$

(c) $\frac{(\ln x)^3}{3} + C$

(d) $3(\ln x)^3 x^2 + C$

(e) None of the above.

$\frac{1}{u}$ $\quad \frac{u^3}{3}$ $\quad \frac{1}{\ln x} + C$ $\quad \ln x$

$\ln x = dx$ $\quad \ln x$ $\quad \frac{1}{x}$ $\quad \frac{1}{\ln x} + C$

$\frac{1}{x} = du$

$\int \frac{1}{u^2}$ $\quad \frac{1}{\ln x}$ $\quad \frac{1}{1/x}$ $\quad x$

20. A train is traveling away from Fort Collins. The speed of the train at time t is

$$s(t) = d'(t) = 0.5t + 20$$

where $d(t)$ is the distance in miles of the train from town at time t. At time $t = 0$, the train is 5 miles from Fort Collins, thus $d(0) = 5$. What is the train's distance from town when $t = 10$?

(a) 305 miles

(b) 15 miles

(c) 175 miles

(d) 230 miles

(e) 300 miles

$\frac{.5t^2}{2} + 20x$

$\frac{1}{4}t^2 + 20x + C = 5$

$\frac{1}{4}(10)^2 + 20(10)$

$25 + 200$