MTH 142 – Practice Exam – Chapters 7-8

Calculus II With Analytic Geometry
Fall 2011 - University of Rhode Island

- This practice exam is intended to help you prepare for the final exam for MTH 142 – Calculus II.
- This practice exam is **NOT** intended to be your only resource in preparing for the exam. Do **NOT** use this in place of your course notes, previous exams, quizzes, homework, and online homework.
- Questions that do not appear on this practice exam may appear on the actual final exam, and just because a question appears on this practice exam does not guarantee a similar question will appear on the actual final exam.
- Also note that this practice exam is not intended to give you an idea of the length of the actual exam.

Good luck!

1. Give an algebraic substitution $x = h(u)$ that will eliminate the radicals from the integral $\displaystyle\int \frac{x^{1/2}}{x^{1/3}+2}dx$.

   (a) $x = u^2$
   (b) $x = u^6$
   (c) $x = u^3$
   (d) $x = u^4$
   (e) $x = \sqrt{u}$

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2. Give an algebraic substitution $t = h(u)$ that will eliminate the radicals from the integral $\displaystyle\int \frac{t^{1/2}+t^{1/4}}{t^{1/2}}\,dt$.

   (a) $t = u^{12}$
   (b) $t = u^{1/2}$
   (c) $t = u^{1/2} + u^{1/4}$
   (d) $t = u^6$
   (e) $t = u^2 + u^4$

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3. Find the integral in terms of u obtained by performing the substitution $x = u^{1/3}$ on the integral $\int_2^3 \frac{x^2}{\sqrt{x^6-1}}\,dx$.

(a) $\int_8^{27} \frac{u^{2/3}}{3\sqrt{u^2-1}}\,du$

(b) $\int_8^{27} \frac{1}{3\sqrt{u^2-1}}\,du$

(c) $\int_2^{3} \frac{1}{3\sqrt{u^2-1}}\,du$

(d) $\int_2^{3} \frac{u^{2/3}}{3\sqrt{u^2-1}}\,du$

(e) $\int_2^{3} \frac{1}{\sqrt{u^2-1}}\,du$

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4. Find the integral in terms of u obtained by performing the substitution $x = \frac{u^2-3}{2}$ on the integral $\int_3^{11} \frac{x^2}{\sqrt{2x+3}}\,dx$.

(a) $\int_3^{11} \frac{(u^2-3)^2}{4}\,du$

(b) $\int_3^{5} \frac{(u^2-3)^2}{4u}\,du$

(c) $\int_3^{11} \frac{(u^2-3)^2}{u}\,du$

(d) $\int_3^{5} \frac{(u^2-3)^2}{4}\,du$

(e) $\int_3^{11} \frac{(u^2-3)^2}{4u}\,du$

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5. Find the integral in terms of u obtained by performing the substitution $x = u^4+1$ on the integral $\int \frac{(x-1)^{1/2}-7}{3-(x-1)^{1/4}}\,dx$.

(a) $\int \frac{4u^5+28u^3}{3+u}\,du$

(b) $\int \frac{u^2-7}{3-u}\,du$

(c) $\int \frac{4u^{11}-28u^3}{3-u}\,du$

(d) $\int \frac{4u^5-28u^3}{3-u}\,du$

(e) $\int \frac{2u^5-14u}{3-u^2}\,du$

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6. Find $\int \frac{x^3}{\sqrt{x^2+9}}\,dx$ using an algebraic substitution.

(a) $\frac{(x^2+9)^{3/2}}{3} - 9\sqrt{x^2+9} + C$

(b) $\frac{(x^2+9)^{5/2}}{3} - 3(x^2+9)^{3/2} + C$

(c) $\frac{(x^2+9)^{3/2}}{3} + 3\sqrt{x} + C$

(d) $\frac{x^2+9}{2} + 9\ln\sqrt{x^2+9} + C$

(e) $\frac{x^2+9}{2} - 9\ln\sqrt{x^2+9} + C$

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7. Find $\int x(2x^2+3)^3\,dx$.

(a) $\frac{(2x^2+3)^4}{16} + C$

(b) $\frac{(2x^2+3)^4}{4} + C$

(c) $(2x^2+3)^4 + C$

(d) $\frac{x(2x^2+3)^4}{16} + C$

(e) $\frac{x(2x^2+3)^4}{4} + C$

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8. $\int (2x-3)^5\,dx$.

(a) $(x^2-3x)^6 + C$

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

(c) $\frac{(2x-3)^6}{12} + C$

(d) $\frac{(2x-3)^6}{6} + C$

(e) $\frac{(x^2-3)^6}{6} + C$

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9. Find $\int \ln 2x \, dx$.

   (a) $x(\ln 2x) - 2x + C$
   (b) $\frac{1}{4}(\ln 2x)^2 + C$
   (c) $x(\ln 2x) - x/2 + C$
   (d) $\frac{1}{2}(\ln 2x)^2 + C$
   (e) $x(\ln 2x) - x + C$

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10. Find $\int \ln x^3 \, dx$.

    (a) $x(\ln x^3) - x + C$
    (b) $x(\ln x^3) - x/3 + C$
    (c) $3[x(\ln x) - x] + C$
    (d) $\ln(x^4/4) + C$
    (e) $3x(\ln x^3) - 3x + C$

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11. Find $\int s(\ln s) \, ds$.

    (a) $s(\ln s^2) - s/2 + C$
    (b) $s^2[(\ln s) - 1] + C$
    (c) $\frac{1}{2}s^2[(\ln s) - 1/2] + C$
    (d) $\frac{1}{2}s^2[(\ln s) - 1] + C$
    (e) $\frac{1}{2}(\ln s)^2 + C$

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12. Find $\int \frac{2x-3}{x+1} \, dx$.

    (a) $2x + 5\ln|x+1| + C$
    (b) $x^2 - 5\ln|x-1| + C$
    (c) $x^2 + 5\ln|x+1| + C$
    (d) $2x - 5\ln|x+1| + C$
    (e) $2x^2 - 5\ln|x-1| + C$

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13. Find $\int \frac{x-1}{4-x}\,dx$.

(a) $\frac{x^2}{8} - \ln|x| + C$
(b) $-x - \ln|4-x| + C$
(c) $\frac{x^2}{8} + \ln|x| + C$
(d) $-x + 3\ln|4-x| + C$
(e) $-x - 3\ln|4-x| + C$

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14. Find $\int \frac{1}{x^2+x}\,dx$.

(a) $-\frac{1}{x} + \ln|x| + C$
(b) $\ln|x| + \ln|x+1| + C$
(c) $\ln\left|\frac{x}{x+1}\right| + C$
(d) $\frac{1}{x} + \ln|x| + C$
(e) $\ln|x+1| - \ln|x| + C$

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15. Find $\int \frac{4}{x^2+2x}\,dx$.

(a) $2\ln\left|\frac{x}{x+2}\right| + C$
(b) $\ln|x^2+x| - \ln|x+2| + C$
(c) $2\ln|x| + \ln|x+2| + C$
(d) $\ln|x| + 2\ln|x+2| + C$
(e) $2\ln\left|\frac{x+2}{x}\right| + C$

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16. Give the form involving A, B, etc. in which one tries to express the integrand in $\int \frac{x^4-1}{x(x^2+1)^2}\,dx$ when finding the integral using the method of partial fractions.

(a) $\frac{A}{x} + \frac{Bx+C}{(x^2+1)^2} + \frac{Dx+E}{x^2+1}$
(b) $\frac{A}{x} + \frac{Bx+C}{(x^2+1)^2}$
(c) $\frac{A}{x} + \frac{B}{(x^2+1)^2}$
(d) $\frac{A}{x} + \frac{Bx}{(x^2+1)^2} + \frac{Cx}{x^2+1}$
(e) $\frac{A}{x} + \frac{Bx+C}{x^2+1}$

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17. Give a trigonometric substitution $x = h(t)$ that will transform $\int \sqrt{25 - 9x^2}\,dx$ into an integral without radicals.

(a) $x = \frac{25}{9}\cos^2 t$

(b) $x = \frac{3}{5}\tan t$

(c) $x = \frac{5}{3}\sin t$

(d) $x = \frac{3}{5}\cos t$

(e) $x = \frac{5}{3}\cos^2 t$

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18. Use the trapezoidal rule with $n = 2$ to find an estimate for $\int_{-1}^{1} 2^x\,dx$. Show your computations.

(a) 2

(b) 21/10

(c) 11/5

(d) 23/10

(e) 9/4

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19. Compute $\int_{1}^{\infty} x^{-3/2}\,dx$, if it converges.

(a) -1

(b) 1

(c) -2

(d) 2

(e) Diverges

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20. Compute $\int_{1}^{5} \frac{1}{\sqrt{u-1}}\,du$, if it converges.

(a) Diverges

(b) 1

(c) 4

(d) 2

(e) -1

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21. Compute $\int_0^\infty \frac{x}{e^x}\,dx$, if it converges.

(a) Diverges
(b) 5/2
(c) 3/2
(d) 1
(e) 2

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22. For what values of p does $\int_1^\infty \frac{1}{x^p}\,dx$ converge?

(a) no values of p
(b) $p > 1$
(c) $p \leq 1$
(d) $p < 1$
(e) $p \geq 1$

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23. Find the area of the region bounded by $y = x^2$ and $y = 2x$.

(a) 3/2
(b) 5/3
(c) 1
(d) 4/3
(e) 5/2

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24. The base of a solid is the semicircular disk bounded by $y = \sqrt{4 - x^2}$ and $y = 0$. Cross sections cut perpendicular to the x-axis are squares. Find the volume of the solid.

(a) 32/3
(b) $16\pi/3$
(c) 16/3
(d) $32\pi/3$
(e) 5

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25. The base of a solid is the region bounded by $y = 0$ and $y = 1 - x^2$. Cross sections cut perpendicular to the y-axis are semicircular disks. Find the volume of the solid.

(a) $\pi/2$
(b) 2π
(c) π
(d) $-\pi/2$
(e) $\pi/4$

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26. Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}, y = 0$, and $x = 4$ about the x-axis.

    (a) 4
    (b) 16π
    (c) 8π
    (d) 16
    (e) 4π

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27. Find the volume of the solid generated by revolving the region bounded by $y = 1 - x$, $y = 0$, and $x = 0$ about the x-axis.

    (a) $\pi/6$
    (b) π
    (c) $3\pi/2$
    (d) $\pi/5$
    (e) $\pi/3$

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28. Find the length of the curve $y = (2/3)x^{3/2}$ from $x = 1$ to $x = 4$.

    (a) $(2/3)(17\sqrt{17} - 1)$
    (b) $(2/3)(5\sqrt{5} - 2\sqrt{2})$
    (c) $(2/3)(5\sqrt{5} - 1)$
    (d) $(8/27)(10\sqrt{10} - 13\sqrt{13}/2)$
    (e) $(3/2)(17\sqrt{17} - 1)$

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29. Find the area inside the spiral $r = 2\theta$ (in polar coordinates) for $0 \leq \theta \leq 2\pi$.

    (a) $4\pi^2/3$
    (b) $16\pi^3/3$
    (c) $8\pi^3/3$
    (d) π^2
    (e) $4\pi^2$

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30. Find the area inside the spiral $r = \sqrt{\theta}$ (in polar coordinates) for $0 \leq \theta \leq \pi$.

    (a) $\pi^2/2$
    (b) $2\pi^{3/2}/3$
    (c) $\pi^{3/2}/3$
    (d) $\pi^2/4$
    (e) π^2

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31. Find the area between the two spirals $r = \theta$ and $r = 2\theta$ (in polar coordinates) for $0 \le \theta \le 2\pi$.

   (a) $2\pi^2$
   (b) $4\pi^3$
   (c) $8\pi^3$
   (d) π^2
   (e) $2\pi^3$

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32. A thin rod reaches from 0 to 4 on the x-axis. The mass density (mass per unit length) of the rod is given by $\delta(x) = 2x + 3$. Find the mass of the rod.

   (a) 19
   (b) 32
   (c) 28
   (d) 16
   (e) 11

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33. Let a plate covering the region bounded by $y = x^2, x = 2$, and $y = 0$ have mass density $\delta(x, y) = x^2 + 1$ at (x, y). Find the mass of the plate.

   (a) 98/15
   (b) 6
   (c) 32/3
   (d) 16
   (e) 136/15

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34. Find the center of mass of a thin rod covering the interval $[0, 2]$ on the x-axis if the mass density (mass per unit length) is $\delta(x) = 2x + 3$ at the point x.

   (a) 10/3
   (b) 7/5
   (c) 17/15
   (d) 6/5
   (e) 19/15

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35. The force F required to compress a spring by x meters is given by $F = 3x$ newtons. Find the work done in compressing the spring from $x = 1$ to $x = 2$.

   (a) 5 Joules.
   (b) 5/2 Joules.
   (c) 1/2 Joules.
   (d) 9/2 Joules.
   (e) 9 Joules.

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36. An empty bucket weighing 15 lb is pulled up to a height of 60 ft using a cable that weighs 1/4 lb/ft. Find the work done (in ft–lbs).

(a) 900 ft–lbs.
(b) 850 ft–lbs.
(c) 1500 ft–lbs.
(d) 1250 ft–lbs.
(e) 1350 ft–lbs.

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37. A quantity has density function $p(x) = x/32$ for $0 \leq x \leq 8$ and $p(x) = 0$ otherwise. Find the mean value of the quantity.

(a) $16/3$
(b) $1/8$
(c) $-16/3$
(d) $1/16$
(e) 1

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38. A quantity has density function $p(x) = x/32$ for $0 \leq x \leq 8$ and $p(x) = 0$ otherwise. Find the median value of the quantity.

(a) $\sqrt{32}$
(b) 16
(c) $\sqrt{32/3}$
(d) $-\sqrt{32}$
(e) 1

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39. A quantity has density function $p(x) = x^3/4$ for $0 \leq x \leq 2$ and $p(x) = 0$ otherwise. Find the mean value of the quantity.

(a) $-16/5$
(b) $8/5$
(c) 1
(d) $-8/5$
(e) $16/5$

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40. A quantity has density function $p(x) = x^3/4$ for $0 \leq x \leq 2$ and $p(x) = 0$ otherwise. Find the median value of the quantity.

(a) $\sqrt[4]{8}$
(b) 1
(c) $\sqrt[3]{2}$
(d) $-\sqrt[4]{8}$
(e) $-\sqrt[3]{2}$

Practice Exam Solutions

1.	B
2.	A
3.	B
4.	D
5.	D
6.	A
7.	A
8.	C
9.	E
10.	C
11.	C
12.	D
13.	E
14.	C
15.	A
16.	A
17.	C
18.	E
19.	D
20.	C
21.	D
22.	B
23.	D
24.	A
25.	E
26.	C
27.	E
28.	B
29.	B
30.	D
31.	B
32.	C
33.	E
34.	C
35.	D
36.	E
37.	A
38.	A
39.	B
40.	A