Answers to Dr. Z.’s Five Practice Exams for Exam 1 (that will take place Oct. 18, 2012)

Disclaimer: Not responsible for any errors!

Prize: One dollar to the first person to point out an error. If the proposed correction is wrong, i.e. if I was right, the person has to pay me 10 cents.

Version of Oct. 17, 2012, 10:20am: Thanks to Taylor Picillo who won a dollar (4#5 previously had the wrong coefficient in front of the middle term $\csc^2 x \cot x$, it now has been corrected)

out that the previous answer of 3#1 was to the indefinite integral. She won a dollar!

Previous corrections (thanks to Le Kim who won almost a dollar (in fact 99 cents), leading to a discovery of a typo in 3#6 (1 previously has $\frac{4}{7\pi}$ instead of the correct $\frac{4}{3\pi}$))


Oct. 16, 2012, 4:40pm: Thanks Taylor P. and Patrick M. (correcting a typo in 3#1, this is the second correction of this answer, before I gave the definite integral, and then I had a typo and put $\frac{5\pi}{6}$ instead of the correct $\frac{5\pi}{16}$.

Oct. 17, 2012, 9:40am: Thanks to Eunhee Kim who won a dollar (4#3(a) previously had the wrong answer $\frac{158}{3}\pi$, it now has been corrected to $\frac{152}{3}\pi$)

Practice Exam 1


1.(a) $(x^2 - 2x + 3)e^x$ (b) $-\frac{3}{2(x-2)} + \frac{1}{4} \ln |x| - \frac{1}{4} \ln |x-2| + C$

2. $\frac{800}{3}$ (or $266 \frac{2}{3}$)

3. $\frac{32}{3}$ (or $10 \frac{2}{3}$).

4. $\frac{128}{3}$ (or $42 \frac{2}{3}$)

5. $\frac{1}{10}$; $\frac{29}{200}$; the ave of the max and min is larger than the average of the function .

6. $\tan^{-1} x + \ln |x+3| + C$.

7. $-\frac{\sqrt{4-y^2}}{4y} + C$.

8. $\frac{1}{5} e^{2x}(2 \sin x - \cos x) + C$, $\frac{1}{5} e^{2x}(\sin x + 2 \cos x) + C$. 


9. (a) \(\ln |\sqrt{x^2 + 6x + 10} + x + 3| + C\) (b) \(-\frac{1}{5} \cos^9 x + \frac{1}{11} \cos^{11} x + C\).
10. \(\frac{4}{3} \tan^3 x - \tan x + x + C\).

**Practice Exam 2**

(available from http://www.math.rutgers.edu/~zeilberg/calc2_2012/mt1P2.pdf)

1. \(\frac{3\sqrt{3}}{2}\)
2. (a) \(\frac{21}{8}\) (or \(2\frac{5}{8}\)) (b) \(\frac{1}{12}\).
3. (a) \(\frac{2048}{11}\pi\) (b) \(\frac{256}{7}\pi\).
4. \(\frac{768}{7}\cdot 2^\pi\).
5. (a) divergent (b) divergent.
6. \(\frac{x^3}{3} - x^2 + 6x - 17 \ln |x + 3| + C\).
7. (a) 68 (b) 8.
8. (a) \(\frac{1}{2} \tan x \sec x + \frac{1}{2} \ln |\sec x + \tan x| + C\) (b) \(4x \ln x - \frac{7x}{2} + \frac{x^3}{3} + \frac{\sin 2x}{4} + C\).
9. \(2 \ln |x + 3| - \ln |x + 5| - \frac{2}{3} \ln |3x - 2| + C\).
10. \(\frac{512\pi}{15}\).

**Practice Exam 3**


1. \(\frac{5\pi}{4}\) (corrected, thanks to Stacy, 10/15/12, the previous posted answer was of the indefinite integral, corrected again (I had a typo before, 10/16/12, thanks to Taylor P. and Patrick M.).
2. \(\frac{3}{16}\pi\).
3. \(\frac{3}{16}\pi\).
4. \(\frac{8}{5(x^2+4)} + \frac{1}{16} \tan^{-1} \frac{x}{2} + C\).
5. (a) convergent, 6 (b) divergent.
6. (corrected Oct. 13, 2012, 10:12am, thanks to Le Kim) \(\frac{4}{17}\) (appr. 0.42); \(\frac{1}{2} = 0.5\), smaller.
7. (a) convergent, \(\frac{5}{3}\) (b) convergent, too complicated to evaluate by either human or computer.
8. \(\frac{7}{3}\); 3; smaller.
9. \[ \frac{1225}{8} \text{ (or } 153\frac{1}{8} \text{).} \]

10. \[ 2 \ln 2 + \frac{2}{m^2} - 4. \]

**Practice Exam 4**


1. \[ \frac{2261}{7000} \text{ (b) } \frac{8}{5}. \]

2. (a) \[ \frac{1}{3}x^3 \tan^{-1} x + \frac{1}{6} \ln(1 + x^2) - \frac{1}{4}x^2 + C \]
   (b) \[ x(\ln x)^3 - 3x(\ln x)^2 + 6x \ln x - 6x + C \]

3. (a) \[ \frac{15\pi}{3} \text{ (corrected by Eunhee Kim, who won a dollar) (b) } \frac{15\pi}{3} \]

4. \[ 2. \]

5. \[ -\frac{1}{5} \cot x \csc^3 x - \frac{4}{15} \cot x \csc^2 x - \frac{8}{15} \cot x + C \]

6. (a) \[ 2xe^{\sqrt{x}} - 4\sqrt{x}e^{\sqrt{x}} + 4e^{\sqrt{x}} + C \]
   (b) \[ \frac{1}{2}(\ln x)^2 \ln(\ln x) - \frac{1}{4}(\ln x)^2 + C. \]

7. (a) convergent, \[ \frac{3}{2} \] (b) convergent, 18.

8. \[ \frac{c^2 + 1}{4(c - 1)}. \]

9. (a) \[ \frac{1}{8} \sec^2(3x) + C \]
   (b) \[ \frac{1}{8} \cos^2(s^2) \sin(s^2) + \frac{1}{8} \sin(s^2) + C. \]

10. (a) \[ \frac{142}{105} \text{ (or } 1\frac{37}{105}\) (b) \[ \frac{1}{4}. \]

**Practice Exam 5**


1. (a) \[ 50 \sin^{-1} \frac{x}{10} + \frac{1}{2}x \sqrt{100 - x^2} + C \]
   (b) \[ \frac{1}{10} \sin^{10} x - \frac{1}{12} \sin^{12} x + C. \]

2. \[ -\frac{1}{4} \sin^3 x \cos x - \frac{3}{8} \sin x \cos x + \frac{3}{8} x + C. \]

3. (a) \[ -\frac{5}{9} + \frac{2}{9}e^{-3} \]
   (b) diverges (since \( \lim_{x \to 0+} \ln x = -\infty \)).

4. \[ \frac{\sqrt{3}}{3} \cdot 4000. \text{ (corrected Oct. 16, 2012, thanks to TA Sjuvon Chung)} \]

5. \[ \pi - 2. \]

6. \[ e = \frac{3}{5}^{\pi/\pi} \text{ (or } e = \frac{35^{1/4}}{5}. \]

7. \[ 2\pi. \]

8. \[ \tan^{-1} x + \ln(x^2 + 4) + C. \]

9. (a) \[ \frac{1216}{31712} \]
   (b) \[ 1. \]
10. Compare with $\frac{1}{x}$; Compare with $x^3 e^{-x^4}$. 