Math 131 Homework: Day 10

My Office Hours: M & W 12:30–2:00, Tu 2:30–4:00, & F 1:15-2:30 or by appointment. **Math Intern** Sun: 12–6pm; M 3-10pm; Tu 2–6, 7–1pm; W and Th: 5-10 pm in Lansing 310. Website: `http://math.hws.edu/~mitchell/Math131S13/index.html`.

Practice

1. a) Read Section 6.1 on velocity and displacement and net change in general. Review Section 5.5 on Substitution. Review the **notes on substitution on line**. There are lots of examples.

   b) ☞ **Practice:** You gotta' practice a lot of substitution problems to get comfortable with them. Previously assigned: Page 363ff #9–23 odd, 27. New problems: Page 363ff #25, 29 and 31 (these last two are very good). Some definite integrals: #35, 39, 41, 59, 63, 65 and 67. Review exercises: Page 367 #21, 25, and 27. **See the practice on the back.**

WeBWorK: Set Day10 due Sunday evening. Start early (long set). WeBWorK set Day09 due Thursday at noon.

Lab Ticket: Hand in at Lab on Thursday. Name: Answers

Use this sheet. **Be very neat so that I can grade them quickly and get them back to you in Lab.**

1. Determine $\int \frac{\sqrt{\ln t}}{t}\,dt.$ $= \int u^{1/2}\,du = \frac{2}{3}u^{3/2}+C = \frac{2}{3}(\ln t)^{3/2}+C$

   $u = \ln t$

   $\boxed{du = \frac{1}{t}\,dt}$

2. Determine $\int (x+2)\tan(x^2+4x)\,dx.$ $= \frac{1}{2}\int \tan u\,du = \frac{1}{2}\ln|\sec u|+C$

   $= \frac{1}{2}\ln|\sec(x^2+4x)|+C$

   $u = x^2+4x$

   $du = (2x+4)\,dx$

   $\boxed{\frac{1}{2}\,du = (x+2)\,dx}$

3. Determine $\int \frac{x^2}{1+4x^6}\,dx$ $= \frac{1}{6}\int \frac{1}{1+u^2}\,du = \frac{1}{6}\arctan u + C$

   $= \frac{1}{6}\arctan(2x^3)+C$

   $u^2 = 4x^6$

   $u = 2x^3$

   $du = 6x^2\,dx$

   $\boxed{\frac{1}{6}\,du = x^2\,dx}$

4. Determine $\int_0^4 x\sqrt{2x+1}\,dx$. Hint: See today's online notes page 11. $\int_0^4 x\sqrt{2x+1}\,dx$

   $u = 2x+1 \Rightarrow u-1 = 2x \Rightarrow x = \frac{u}{2}-\frac{1}{2}$

   $du = 2dx \Rightarrow \boxed{\frac{1}{2}\,du = dx}$

   $x = 0 \Rightarrow u = 1$

   $x = 4 \Rightarrow u = 9$

   $= \frac{1}{2}\int_1^9 \left(\frac{u}{2}-\frac{1}{2}\right)u^{1/2}\,du$

   $= \frac{1}{4}\int_1^9 u^{3/2}-u^{1/2}\,du$

   $= \frac{1}{4}\left[\frac{2}{5}u^{5/2}-\frac{2}{3}u^{3/2}\right]_1^9$

   $\Rightarrow = \frac{1}{4}\left[\frac{2}{5}(243)-18\right]-\frac{1}{4}\left[\frac{2}{5}-\frac{2}{3}\right] = \frac{1}{4}\left[\frac{1452-260}{15}\right] = \frac{298}{15}$

   ≈ 19.867

Also see next page

$$\int_0^4 x\sqrt{2x+1}\,dx = \int_1^3 \frac{1}{2}(u^2-1)\cdot u\cdot u\,du = \frac{1}{2}\int_1^3 u^4-u^2\,du$$

$$= \frac{1}{2}\left[\frac{u^5}{5}-\frac{u^3}{3}\right]\Bigg|_1^3$$

$$= \frac{1}{2}\left[\frac{243}{5}-9\right]-\frac{1}{2}\left[\frac{1}{5}-\frac{1}{3}\right]$$

$$= \frac{298}{15}$$

$u = \sqrt{2x+1} \longrightarrow x=0 \Rightarrow u=1$

$x=4 \Rightarrow u=3$

$u^2 = 2x+1$

$u^2-1 = 2x$

$\frac{1}{2}(u^2-1) = x$

$u\,du = dx$