Math 131 Day 26

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`.

Reading and Practice

We will finish the discussion of partial fractions by looking at complications that can arise. We will only consider partial fraction problems with linear factors. Reread Section 7.4 through Examples 1 and 2 through page 480. You should skim the rest of the section, but we will not cover it in any detail. Also see the online notes for Day 25.

a) **Review** L'Hôpital's Rule: Section 4.7.
b) **Read** in Section 7.7 from page 502 through the top of 506 about Improper Integrals on unbounded intervals.
c) Assigned last time: Try page 483 #9, 11, 13, 15, and if we get this far: #19, 21, and 23.

1. You need to keep practicing. Try integrating these rational functions (answers below). These are a bit harder than those in the text. Some have three factors. Others have repeated factors.

a) $\displaystyle\int \frac{4t^2-3t-4}{t^3-t^2-2t}\,dt$ **b)** $\displaystyle\int \frac{t+7}{(t+1)(t^2-4t+3)}\,dt$ **c)** $\displaystyle\int \frac{x+6}{x^2-x-6}\,dx$

d) $\displaystyle\int \frac{x}{(x-1)(x+1)(x+2)}\,dx$ **e)** $\displaystyle\int \frac{2x^2}{(x-1)^2(x+1)}\,dx$ **f)** $\displaystyle\int \frac{-4x+4}{(x-2)^2x}\,dx$

2. Try these similar looking problems.

a) $\displaystyle\int \frac{10}{25+x^2}\,dx$ **b)** $\displaystyle\int \frac{10x}{25+x^2}\,dx$ **c)** $\displaystyle\int \frac{10}{25-x^2}\,dx$

3. **a)** Limits (assuming we get this far): Try page 290ff #13, 15, 31, 19–29 (odd), 33, 37, 39, 45.
b) **Extra Credit**. I wanted to assign problem #29. But I didn't. Why not?

Hand in next time

Finish WeBWorK `Day25` and begin `Day26`.

1. Try these three integrals.

a) $\displaystyle\int \frac{2}{x^3-x}\,dx$ **b)** $\displaystyle\int \frac{2x^2}{(x-1)^2(x+1)}\,dx$ **c)** $\displaystyle\int \frac{-4x+4}{(x-2)^2x}\,dx$

2. Assuming we get to l'Hopital's rule, try these. In each, make sure to check whether l'Hopital's rule applies. Remember to use the following limits when necessary: $\lim_{x\to-\infty} e^x = 0$, $\lim_{x\to+\infty} e^x = +\infty$, $\lim_{x\to+\infty} \ln x = +\infty$, and $\lim_{x\to0^+} \ln x = -\infty$.

a) $\displaystyle\lim_{x\to-1} \frac{x^2-2x-3}{x+1}$ **b)** $\displaystyle\lim_{x\to1} \frac{\ln(x^2)}{x^2-1}$ **c)** $\displaystyle\lim_{x\to0} \frac{\sin(ax)}{\sin(bx)}$, $b \neq 0$

d) $\displaystyle\lim_{x\to0} \frac{x}{\arctan(2x)}$ **e)** $\displaystyle\lim_{x\to1} \frac{(\ln x)^2}{x^3}$ **f)** $\displaystyle\lim_{x\to0} \frac{\sin^2(3x)}{x^2}$ **g)** $\displaystyle\lim_{x\to1} \frac{x^n-1}{x-1}$, n a positve integer

Answers to Practice Problems

1. **a)** $\int \frac{2}{t} + \frac{1}{t-2} + \frac{1}{t+1}\,dt = 2\ln|t| + \ln|t-2| + \ln|t+1| + c$
b) $\int \frac{3/4}{t+1} + \frac{5/4}{t-3} - \frac{2}{t-1}\,dt = \frac{3}{4}\ln|t+1| + \frac{5}{4}\ln|t-3| - 2\ln|t-1| + c$
c) $\int \frac{9/5}{x-3} - \frac{4/5}{x+2}\,dt = x + \frac{9}{5}\ln|x-3| - \frac{4}{5}\ln|x+2| + c$
d) $\int \frac{1/6}{x-1} + \frac{1/2}{x+1} - \frac{2/3}{x+2}\,dt = \frac{1}{6}\ln|x-1| + \frac{1}{2}\ln|x+1| - \frac{2}{3}\ln|x+2| + c$
e) $\int \frac{3/2}{x-1} + \frac{1}{(x-1)^2} + \frac{1/2}{x+1}\,dt = \frac{3}{2}\ln|x-1| - (x-1)^{-1} + \frac{1}{2}\ln|x+1| + c$
f) $\int -\frac{1}{x-2} - \frac{2}{(x-2)^2} + \frac{1}{x}\,dt = -\ln|x-2| + 2(x-2)^{-1} + \ln|x| + c$

2. **a)** $2\arctan(x/5) + c$ **b)** $5\ln|25+x^2| + c$ **c)** $\ln\left|\frac{x+5}{x-5}\right| + c$