My Office Hours: M & W 2:30–4:00, Tu 2:00–3:30, & F 1:30–2:30 or by appointment. **Math Intern:** Sun: 2:00–5:00, 7:00–10pm; Mon thru Thu: 3:00–5:30 and 7:00–10:30pm in Lansing 310. Website: `http://math.hws.edu/~mitchell/Math131F15/index.html`.
Remember Exam 1 is next week in Lab. Exam in Lab on Thursday. Review labs, homework (including WeBWorK), MVT. See the back of this page for material to review. I will put a Practice/Review on line, and eventually post the answers.

Homework for Next Class

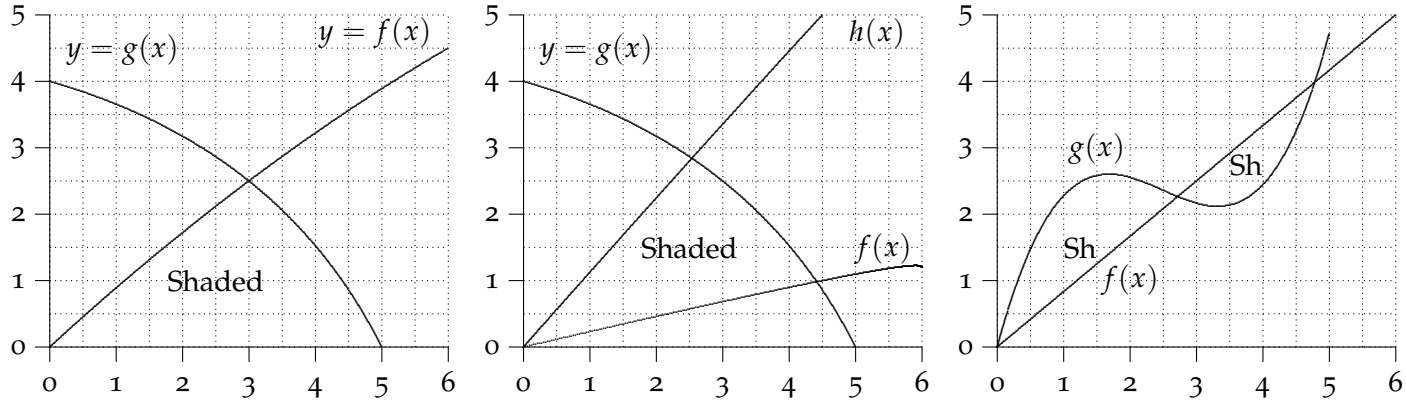
Work on WeBWorK Day 12 as part of your review.

1. Sketch the region bounded by $y = x$ and $y = x^2 - 2$ and find its area.
2. Page 417 #17 (In the first quadrant. Check your answer in the back.)
3. Page 417 #20
4. Page 417 #22 (Hint: $y = 12 - 4x = 4(3 - x)$.)
5. Page 417 #16 (Hint: One intersection is $x = \frac{\pi}{3}$.) Be careful with the trig values.
6. Extra Credit: Page 417 #7 (Show your work. Look up the antidervative of a^x if you do not remember it.)
7. See the middle graph below. Set up the integral for the "Shaded" area enclosed by the three curves.

☕*Practice*

The following questions also appear in the Practice Review on line, where the answers are available.

1. Set up the integrals using the functions $f(x)$, $g(x)$, and $h(x)$ and their points of intersection that would be used to find the shaded areas in the three regions below.



2. Sketch the regions for each of the following problems before finding the areas.
   (*a*) Find the area enclosed by the curves $y = x^3$ and $y = x^2$. (Answer: 1/12)
   (*b*) Find the area enclosed by the curves $y = x^3 + x$ and $y = 3x^2 - x$. (Answer: 1/2)
   (*c*) Find the area between the curves $f(x) = \cos x + \sin x$ and $g(x) = \cos x - \sin x$ over $[0, 2\pi]$. (Answer: 8)

☞ See back.

☕ *Practice*

1. Exam in Lab on Thursday. Review labs, homework (including WeBWorK), MVT. Try the Practice Test problems that will be posted on line. **No graphing or programmable calculators are allowed. I will provide you with a basic calculator.**

(*a*) You should be comfortable with upper and lower sums and general Riemann Sums.

(*b*) You should know your summation formulas and how to use them in limits.

(*c*) You should be able to draw left, right, upper, and lower sums and estimate their values from a graph (including graphs that are below the x-axis).

(*d*) You should know the MVT and be able to draw a graph that illustrates it.

(*e*) You should know the connection between the definition of (net) area and the definite integral and how to use this to estimate definite integrals. You should know how to calculate total area.

(*f*) Know the basic antiderivative formulas. This list now includes $\int \tan x\,dx$ and $\int \sec x\,dx$.

(*g*) Know your integral properties.

(*h*) You should be able to do simple flow or motion problems (finding velocity and position from acceleration).

(*i*) Using the graph of $f(t)$, you should be able to interpret the meaning of $F(x) = \int_a^x f(t)\,dt$ (as net area). You should be able to locate max and min values of F, etc.

(*j*) Know how to use FTC I.

(*k*) You should be able to do all types of substitution problems, including those involving $\arctan u$, $\arcsin u$, $\ln|u|$, and the substitution versions of $\int \tan u\,du$ and $\int \sec u\,du$.

(*l*) You should be able to do definite integrals using the FTC, including those that use substitution (either convert the limits or switch from u back to x at the end of the problem).

(*m*) Average value problems.

(*n*) You should be able to determine displacement and distance travelled from velocity. You should be able to determine velocity and position form acceleration.

(*o*) Simple problems involving area between curves (Section 6.2).

2. (*a*) Read/Review Section 6.2 on Area Between Curves. Look ahead and skim the first few pages of Section 6.3 on Volume, a cool application of integration.

(*b*) Practice page 388 #5, 7(what is the antiderivative of 2^x?), 9, 11

(*c*) Try the problems at the bottom of this sheet.

3. Given a quantity Q with a known rate of change Q'. Net change $= Q(b) - Q(a) = \int Q'(t)\,dt$ and

Future value $= Q(t) = Q(0) + \int_0^t Q'(x)\,dx$

(*a*) Example: The population of an endangered species changes at the rate $P(t) = 300 - 2t$ indiv/yr. If $P(0) = 300$, determine: The population after 5 years.

(*b*) The net change in the population from year 1 to year 4.

(*c*) Determine when the population becomes extinct.