Exam 3 is scheduled for Friday, April 9. It will cover all of Chapter 4, Section 5.1, and Section 6.1. (In Section 6.1 you do not need to study the problems past #40.)

Review the basic differentiation formulas: $\frac{d}{dx}\,(f(x)+g(x)) = f'(x)+g'(x)$ $\frac{d}{dx}\,kf(x) = kf'(x)$

General power rule: $\frac{d}{dx}\,(u(x))^r = r(u(x))^{r-1}u'(x)$

Product rule: $\frac{d}{dx}\,f(x)g(x) = f'(x)g(x)+f(x)g'(x)$

Quotient rule: $\frac{d}{dx}\,\frac{f(x)}{g(x)} = \frac{f'(x)g(x)-f(x)g'(x)}{g(x)^2}$

Chapter 4: Algebra formulas for log and exponential functions:

$u = e^{\ln u}$ $\ln(e^u) = u$ $\ln(uv) = \ln(u)+\ln(v)$ $\ln\left(\frac{u}{v}\right) = \ln(u)-\ln(v)$ $\ln\left(u^k\right) = k\ln(u)$

Chapter 4: Calculus formulas for log and exponential functions:

$\frac{d}{dx}\,e^x = e^x$ $\frac{d}{dx}\,e^{u(x)} = e^{u(x)}u'(x)$ $\frac{d}{dx}\ln\,|x| = \frac{1}{x}$ $\frac{d}{dx}\ln u(x) = \frac{u'(x)}{u(x)}$

Section 5.1: Exponential growth and decay

The problems contain some clue that exponential growth or decay is involved, such as "a population is growing exponentially"; "a population is growing at a rate proportional to its size"; or "a radioactive material decays...". This means you should use one of these formulas:

Exponential growth: $P(t) = P_0e^{kt}$ Exponential decay: $P(t) = P_0e^{-\lambda t}$

In these formulas, P_0 is the initial amount; the growth constant is k or λ, respectively. The problem will either give you the value of the growth constant, or else it will give you enough information to compute it. For radioactive decay, it is often necessary to comput the growth constant from the half-life of the material (the length of time it takes for the material to decay to half the original amount).

Section 6.1: Anti-derivatives

The notation $\int f(x)\,dx$ stands for the anti-derivative of $f(x)$. Working backwards, each differentiation formula has a corresponding anti-differentiation formula. These are also called integration formulas.

$\int f(x)+g(x)\,dx = \int f(x)\,dx + \int g(x)\,dx$ $\int kf(x)\,dx = k\int kf(x)\,dx$

$\int x^r\,dx = \frac{x^{r+1}}{r+1}+C$, if $r \neq -1$ $\int x^{-1}\,dx = \ln|x|+C$ $\int e^{kx}\,dx = \frac{e^{kx}}{k}+C$