**Formula sheet for Math 152, Exam 1, Spring 2009** for sections 1, 2, 3, 6, 7, 8, & 9

$$\begin{cases} (\cos x)^2 + (\sin x)^2 = 1 \\ 1 + (\tan x)^2 = (\sec x)^2 \\ 1 + (\cot x)^2 = (\csc x)^2 \end{cases} \qquad \begin{cases} \sin A \cos B = \frac{1}{2}[\sin(A-B) + \sin(A+B)] \\ \sin A \sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)] \\ \cos A \cos B = \frac{1}{2}[\cos(A-B) + \cos(A+B)] \end{cases}$$

$$\sin(2x) = 2\sin x \cos x; \ \cos(2x) = (\cos x)^2 - (\sin x)^2; \ (\cos x)^2 = \frac{1}{2}\big(1 + \cos(2x)\big); \ (\sin x)^2 = \frac{1}{2}\big(1 - \cos(2x)\big).$$

$$\sin(0) = 0; \ \sin\left(\tfrac{\pi}{6}\right) = \tfrac{1}{2}; \ \sin\left(\tfrac{\pi}{4}\right) = \tfrac{\sqrt{2}}{2}; \ \sin\left(\tfrac{\pi}{3}\right) = \tfrac{\sqrt{3}}{2}; \ \sin\left(\tfrac{\pi}{2}\right) = 1$$

$$\cos(0) = 1; \ \cos\left(\tfrac{\pi}{6}\right) = \tfrac{\sqrt{3}}{2}; \ \cos\left(\tfrac{\pi}{4}\right) = \tfrac{\sqrt{2}}{2}; \ \cos\left(\tfrac{\pi}{3}\right) = \tfrac{1}{2}; \ \cos\left(\tfrac{\pi}{2}\right) = 0$$

$$\int \sec x \, dx = \ln|\sec x + \tan x| + C; \ \int \csc x \, dx = \ln|\csc x - \cot x| + C.$$

### Approximate Integration

Midpoint: $M_N = \Delta x[f(c_1) + f(c_2) + \cdots + f(c_N)]$ if $c_j = (x_{j-1} + x_j)/2$

Trapezoidal: $T_N = \frac{\Delta x}{2}[f(x_0) + 2f(x_1) + 2f(x_2) + \cdots + 2f(x_{n-2}) + 2f(x_{n-1}) + f(x_N)]$

Simpson: $S_N = \frac{\Delta x}{3}[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + \cdots + 2f(x_{n-2}) + 4f(x_{n-1}) + f(x_N)]$

### Error Estimates

If $I = \int_a^b f(x)\,dx$ then: $|T_N - I| \le \frac{K_2(b-a)^3}{12N^2}$; $|M_N - I| \le \frac{K_2(b-a)^3}{24N^2}$; $|S_N - I| \le \frac{K_4(b-a)^5}{180N^4}$.

### Important: what is there and what isn't there

What's above will be handed out along with the exam on Monday, February 23. No other notes and no electronic devices (calculators, cell phones, ipods, etc.) may be used during the exam.

Students should notice what is not there. Not appearing are straightforward facts from "Calc 1" which you *must* know in order to do computations here. These facts include derivatives and integrals of simple algebraic functions, trig functions (sine, cosine, tangent and secant*), inverse trig functions (yes, arctan and arcsine), and ln and exp. Of course, formulas and procedures of Calc 2 are not included because that is what is being tested. This includes integration by parts and the formulas and techniques of partial fractions.

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\* The antiderivative of secant is so darn strange that it is included.