Homework #1   **Math 527, UNH fall 2011**
Due Friday, Sept 2nd in lecture

Instructions: Differential equations require a good knowledge of calculus. You should be able to do these problems easily. Problems 1–10 and 14–21 are especially simple. You should be able to do these in your head. If you can't, go back to your calculus textbook, study the relevant topic, and work through similar examples until you can. The other problems will require more work –integration by parts in a few cases. Provide your work for these on attached sheets. One problem cannot be further simplifed: the only decent answer is "X = X", where "X = " is the original problem statement. And remember, **AWE: Always Write Equations!**

1. $\frac{d}{dx} 6x^3 =$

2. $\frac{d}{dx} 2x^{-1} =$

3. $\frac{d}{dx} ax^n =$

4. $\frac{d}{dx} \sum_{n=0}^{N} a_n x^n =$

5. $\frac{d}{dt} (a \cos \omega t + b \sin \omega t) =$

6. $\frac{d}{dx} e^{\alpha x} =$

7. $\frac{d}{dx} \ln \mu x =$

8. $\frac{d}{dx} \sin \alpha x^2 =$

9. $\frac{d}{dx} x^2 \sin \alpha x =$

10. $\frac{d}{dx} \frac{x^2}{\sin \alpha x} =$

11. $\frac{d}{dx} \sum_{n=0}^{\infty} \frac{1}{n!} \lambda^n x^n =$

12. $\frac{d}{dx} \int f(x)\, dx =$

13. $\frac{d}{dx} \int_0^x f(s)\, ds =$

14. $\int 8x^3\, dx =$

15. $\int_0^1 8x^3\, dx =$

16. $\int_0^y 8x^3\, dx =$

17. $\int \sum_{n=0}^N a_n x^n\, dx =$

18. $\int \frac{1}{x}\, dx =$

19. $\int \frac{d}{dx} f(x)\, dx =$

20. $\int \frac{dy}{dx}\, dx =$

21. $\int \frac{d^n y}{dx^n}\, dx =$

22. $\int y\, dx =$

23. $\int \ln x\, dx =$

24. $\int \tan^{-1} x\, dx =$

25. $\int \sum_{n=0}^\infty \frac{1}{n!} \lambda^n x^n\, dx =$

26. Solve the system $3x^2 - 2y = 0$, $4x + y = 1$ for x and y.

Some Greek letters you should know and their typical mathematical use

α	alpha	real-valued constant
β	beta	real-valued constant
γ	gamma	real-valued constant
ϵ	epsilon	infinitesimal or very small constant
λ	lambda	eigenvalue or coefficient in an exponent
θ	theta	an angle
μ	mu	parameter or a coefficient in an exponent
ν	nu	a parameter
ξ	xi	pronounced "cksee"
ρ	rho	
σ	tau	time-like variable
ϕ	phi	function
ψ	psi	function
ω	omega	frequency, i.e. coefficient of t in $\cos \omega t$