BONUS PROBLEM SET:
INTEGRATION EDITION

<u>Integrate the following:</u>

1. $\displaystyle \int \left(\frac{x+3}{\sqrt{x+1}} \right) dx$

2. $\displaystyle \int \left(\frac{dx}{\sqrt{x}\sqrt{x}+x} \right)$

3. $\displaystyle \int (\cos t - \sin t)dt$

4. $\displaystyle \int \tan x \sec^2 x dx$

5. $\displaystyle \int \csc x(\cot x - 3 \csc x)dx$

6. $\displaystyle \int \left(\frac{2}{\pi}x - 2\sec^2 x \right)dx$

7. $\displaystyle \int \cos^2 \frac{\pi}{2}x \sin \frac{\pi}{2}x dx$

8. $\displaystyle \int \cos^2 5x dx$

9. $\displaystyle \int \sin^2 3x dx$

10. $\displaystyle \int \sec^2 x \tan x dx$

11. $\displaystyle \int \left(\frac{\csc^2 2x}{\sqrt{2+\cot 2x}} \right) dx$

12. $\displaystyle \int \left(\frac{\sin\left(\frac{1}{x}\right)}{x^2} \right) dx$

13. $\displaystyle \int x^2 \tan(x^3 + \pi)\sec^2(x^3 + \pi)dx$

14. $\displaystyle \int (\sin x - x \cos x)^3 dx$

15. $\displaystyle \int e^{-6x} dx$

16. $\displaystyle \int \ln e^x dx$

17. $\displaystyle \int x\left(e^{x^2} + 2\right)dx$

18. $\displaystyle \int e^x \sec e^x dx$

19. $\displaystyle \int e^{-x}\left[1 + \cos(e^{-x})\right]dx$

20. $\displaystyle \int (2^x + x^2)dx$

21. $\displaystyle \int e^x \cos(2 - e^x)dx$

22. $\displaystyle \int \tan^2 2x dx$

23. $\displaystyle \int \sec^4 t dt$

24. $\displaystyle \int \frac{x dx}{2 + 3x}$

25. $\displaystyle \int x^3 \sin x dx$

26. $\displaystyle \int x^3 \ln x dx$

27. $\displaystyle \int \left(\frac{e^{\sqrt{x}}}{\sqrt{x}} \right) dx$

28. $\displaystyle \int \cos 2x \sin^3 2x dx$

29. $\displaystyle \int e^x \tan e^x$

30. $\displaystyle \int (\sin^3 x + \sin^5 x - \sin^7 x - \tan^7 x)dx$

<u>Prove the following:</u>

1. Using $\displaystyle \int e^x dx = e^x + C$, prove:
$$\int a^x dx = \frac{a^x}{\ln a} + C$$

2. $\displaystyle \int \tan x dx = \ln(\sec x) + C$