Homework Math 140
To be quizzed Tuesday May 7.

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Problem 1 *Verify by differentiation that the formula is correct.*

1. $\int \frac{1}{x^2\sqrt{1+x^2}}dx = -\frac{\sqrt{1+x^2}}{x} + C.$
2. $\int cos^2x\ dx = \frac{1}{2}x + \frac{1}{4}\sin(2x) + C.$
3. $\int \cos^3 x\ dx = \sin x - \frac{1}{3}\sin^3(x) + C.$
4. $\int \frac{x}{\sqrt{a+bx}}dx = \frac{2}{3b^2}(bx-2a)\sqrt{a+bx} + C$

Problem 2 *Evaluate the definite integral.*

1. $\int_{-2}^{3}(x^2-3)dx.$
2. $\int_{1}^{2}(4x^3-3x^2+2x)dx.$
3. $\int_{-2}^{0}\left(\frac{1}{2}t^4+\frac{1}{4}t^3-t\right)dt.$
4. $\int_{0}^{3}(1+6w^2-10w^4)dw.$
5. $\int_{0}^{2}(2x-3)(4x^2+1)dx.$
6. $\int_{-1}^{1}t(1-t)^2dt.$
7. $\int_{0}^{\pi}(4\sin\theta-3\cos\theta)d\theta.$
8. $\int_{1}^{2}\left(\frac{1}{x^2}-\frac{4}{x^3}\right)dx.$
9. $\int_{1}^{4}\left(\frac{4+6u}{\sqrt{u}}\right)du.$
10. $\int_{1}^{2}\left(x+\frac{1}{x}\right)^2dx.$
11. $\int_{1}^{4}\sqrt{\frac{5}{x}}dx.$
12. $\int_{1}^{9}\frac{3x-2}{\sqrt{x}}dx.$
13. $\int_{1}^{4}\sqrt{t}(1+t)dt.$
14. $\int_{\frac{\pi}{4}}^{\frac{\pi}{4}}\csc^2\theta\ d\theta.$
15. $\int_{0}^{\frac{\pi}{4}}\frac{1+\cos^2\theta}{\cos^2\theta}d\theta.$
16. $\int_{0}^{\frac{\pi}{3}}\frac{\sin\theta+\sin\theta\tan^2\theta}{\sec^2\theta}d\theta.$
17. $\int_{0}^{1}\frac{1+\sqrt[3]{x}}{\sqrt{x}}dx.$
18. $\int_{1}^{8}\frac{x-1}{\sqrt[3]{x^2}}dx.$
19. $\int_{0}^{1}(\sqrt[4]{x^5}+\sqrt[5]{x^4})dx.$
20. $\int_{0}^{1}(1+x^2)^3dx.$
21. $\int_{2}^{5}|x-3|dx.$
22. $\int_{0}^{2}|2x-1|dx.$
23. $\int_{-1}^{2}(x-2|x|)dx.$
24. $\int_{0}^{\frac{3\pi}{2}}|\sin x|dx.$

Problem 3 *Evaluate the indefinite integral.*

1. $\int x\sin(x^2)\ dx.$
2. $\int x^2\cos(x^3)\ dx.$
3. $\int(1-2x)^9\ dx.$

4. $\int (3t+2)^{2.4}\ dt.$

5. $\int (x+1)\sqrt{2x+x^2}\ dx.$

6. $\int \sec^2(2\theta)\ d\theta.$

7. $\int \sec(3t)\tan(3t)\ dt.$

8. $\int u\sqrt{1-u^2}\ du.$

9. $\int \frac{a+bx^2}{\sqrt{3ax+bx^3}}\ dx.$

10. $\int \frac{\sin\sqrt{x}}{\sqrt{x}}\ dx.$

11. $\int \sec^2\theta\tan^3\theta\ d\theta.$

12. $\int \cos^4\theta\sin\theta\ d\theta.$

13. $\int (x^2+1)(x^3+3x)^4\ dx.$

14. $\int \sqrt{x}\sin(1+x^{\frac{3}{2}})\ dx.$

15. $\int \frac{\cos x}{\sin^2 x}\ dx.$

16. $\int \frac{\cos\left(\frac{\pi}{x}\right)}{x^2}\ dx.$

17. $\int \frac{z^2}{\sqrt[3]{1+z^3}}\ dz.$

18. $\int \frac{dt}{\cos^2 t\sqrt{1+\tan t}}.$

19. $\int \sqrt{\cot x}\csc^2 x\ dx.$

20. $\int \sin t\sec^2(\cos t)\ dt.$

21. $\int \sec^3 x\tan x\ dx.$

22. $\int x^2\sqrt{2+x}\ dx.$

23. $\int x(2x+5)^8\ dx.$

24. $\int x^3\sqrt{x^2+1}\ dx.$

Problem 4 *Evaluate the integral. You may use the formula* $\int \frac{1}{1+x^2}dx = \arctan x + C$. *The function* $\arctan x$ *is the arctangent function (sometimes written as* $\tan^{-1} x$*).*

1. $\int \frac{dx}{5-3x}.$

2. $\int e^x\sin(e^x)dx.$

3. $\int \frac{(\ln x)^2}{x}dx.$

4. $\int \frac{dx}{ax+b}dx,\ a\neq 0.$

5. $\int e^x\sqrt{1+e^x}dx.$

6. $\int e^{\cos t}\sin t dt.$

7. $\int e^{\tan x}\sec^2 x dx.$

8. $\int \frac{\arctan^{-1} x}{1+x^2}dx.$

9. $\int \frac{1+x}{1+x^2}dx.$

10. $\int \frac{\sin\ln x}{x}dx.$

11. $\int \frac{\sin(2x)}{1+\cos^2 x}dx.$

12. $\int \frac{\sin x}{1+\cos^2 x}dx.$

13. $\int \cot x dx.$

14. $\int \frac{x}{1+x^4}dx.$

15. $\int_e^{e^4} \frac{dx}{x\sqrt{\ln x}}dx.$

16. $\int_0^1 xe^{-x^2}dx.$

17. $\int_0^1 \frac{e^z+1}{e^z+z}dz.$