

AMAT 219 SHEET # 1

Determine each of the following integrals

1. $\int x^3 e^{-2x} dx$

2. $\int \ln^2(3x^5) dx$

3. $\int \arcsin(4x) dx$

4. $\int (x^2 - 4x + 2) e^x dx$

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

6. $\int x^{\frac{2}{5}} \ln(x) dx$

7. $\int \operatorname{arccosh}(3x) dx$

8. $\int \ln(2x - 3) dx$

9. $\int (x) \operatorname{arcsec}(x) dx$, $x > 1$

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

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

12. $\int (2x^2 - x) \sin(3 - 2x)$

13. $\int \arctan(2x) dx$

14. $\int x^{11} e^{x^4} dx$

15. $\int e^{3x} \sin(4x) dx$ (Use parts twice)

16. $\int \sin(\sqrt{x}) dx$ (Use the

substitution $x = t^2$)

17. $\int \sec^3(3x) dx$

18. $\int (2x) \arcsin(x) dx$

19. $\int \frac{\sqrt{16 - 9x^2}}{x^2} dx$

20. $\int \frac{1}{4x^2 - 12x + 10} dx$

21. $\int \frac{2x + 3}{\sqrt{-2x - x^2}} dx$

22. $\int \frac{1}{x^2 + 6x + 9} dx$

23. $\int \sqrt{100 - x^2} dx$

24. $\int \frac{1}{(36 + x^2)^{\frac{3}{2}}} dx$

25. $\int \frac{1}{(1 - x^2)^{\frac{3}{2}}} dx$

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

27. $\int \frac{1}{x^2\sqrt{x^2-4}} dx$

28. $\int \frac{2x-1}{\sqrt{x^2-x+1}} dx$

29. Find the arc length of the parabolic arc $y = \frac{1}{2}x^2$, $0 \leq x \leq 1$.30. Find the volume of the solid generated by revolving the region enclosed by $y = \cos(x)$,and the x -axis, $0 \leq x \leq \frac{\pi}{2}$ about the y -axis.

ANSWERS TO AMAT 219 PRACTICE SHEET # 1

1. $-\frac{1}{8}(4x^3 + 6x^2 + 6x + 3)e^{-2x} + C$

2. Hint : Let $t = \sqrt[5]{3}x$. Ans. $25x[\ln^2(\sqrt[5]{3}x) - 2\ln(\sqrt[5]{3}x) + 2] + C$

3. $(x)\arcsin(4x) + \frac{1}{4}\sqrt{1-16x^2} + C$

4. $e^x(x^2 - 6x + 8) + C$

5. $\frac{1}{3}(x-1)^2 \sin(3x) + \frac{2}{9}(x-1) \cos(3x) - \frac{2}{27} \sin(3x) + C$

6. $\frac{5}{7}x^{\frac{7}{5}} \ln(x) - \frac{25}{49}x^{\frac{7}{5}} + C$

7. $(x)\operatorname{arccosh}(3x) - \frac{1}{3}\sqrt{9x^2-1} + C$

8. $(x - \frac{3}{2}) \ln(2x - 3) - x + C$

9. $\frac{1}{2}x^2 \operatorname{arcsec}(x) - \frac{1}{2}\sqrt{x^2-1} + C$

10. $\arctan(e^x) + C$

11. $\frac{1}{4} \ln^4(x) + C$

12. $\frac{1}{2}(2x^2 - x) \cos(3 - 2x) + \frac{1}{4}(4x - 1) \sin(3 - 2x) - \frac{1}{2} \cos(3 - 2x) + C$

13. $x \arctan(2x) - \frac{1}{4} \ln(1 + 4x^2) + C$

14. $\frac{1}{4}(x^8 - 2x^4 + 2)e^{x^4} + C$

15. $\frac{e^{3x}}{25}[3 \sin(4x) - 4 \cos(4x)] + C$

16. $2[-\sqrt{x} \cos(\sqrt{x}) + \sin(\sqrt{x})] + C$
17. $\frac{1}{6}[\sec(3x) \tan(3x) + \ln(\sec(3x) + \tan(3x))] + C$
18. $x^2 \arcsin(x) - \frac{1}{2}(\arcsin(x) - x\sqrt{1-x^2}) + C$
19. $-\frac{\sqrt{16-9x^2}}{x} - 3\arcsin\left(\frac{3x}{4}\right) + C$
20. $\frac{1}{2} \arctan(2x-3) + C$
21. $-2\sqrt{1-(x+1)^2} + \arcsin(x+1) + C$
22. $\frac{-1}{x+3} + C$
23. $50\arcsin\left(\frac{x}{10}\right) + \frac{1}{2}x\sqrt{100-x^2} + C$
24. $\frac{x}{36\sqrt{36+x^2}} + C$
25. $\frac{x}{\sqrt{1-x^2}} + C$
26. $-\frac{\sqrt{1+x^2}}{x} + C$
27. $\frac{\sqrt{x^2-4}}{4x} + C$
28. $2\sqrt{x^2-x+1} + C$
29. Arc Length $= \int_0^1 \sqrt{1+x^2} dx = \frac{1}{2}[\ln(1+\sqrt{2}) + \sqrt{2}]$
30. Volume $= 2\pi \int_0^{\frac{\pi}{2}} x \cos(x) dx = \pi(\pi-2)$