Math 171   Integration Review 2

Evaluate the following integrals. The point here is not to have someone tell you which method to use, but to learn to decide for yourself. Struggle with the ones you find difficult for a while before you seek help.

1. $\displaystyle \int t \sin\left(t^2\right) dt$

2. $\displaystyle \int t\left(\sin t\right)^2 dt$

3. $\displaystyle \int \sqrt{1 - 4x^2}\, dx$

4. $\displaystyle \int x\sqrt{1 - 4x^2}\, dx$

5. $\displaystyle \int \frac{x^2 + 1}{x}\, dx$

6. $\displaystyle \int \frac{1 - y}{\sqrt{-y^2 + 2y + 8}}\, dy$

7. $\displaystyle \int \frac{1}{\sqrt{-y^2 + 2y + 8}}\, dy$

8. $\displaystyle \int \frac{1}{-y^2 + 2y + 8}\, dy$

9. $\displaystyle \int \frac{2 - y}{\sqrt{-y^2 + 2y + 8}}\, dy$

10. $\displaystyle \int \ln\left(\frac{x - 2}{x + 1}\right) dx$

11. $\displaystyle \int \cos x \, \ln\left(\sin x\right) dx$

12. $\displaystyle \int \frac{5x^2}{(x - 3)(x + 2)^2}\, dx$

13. $\displaystyle \int \frac{\sec^2 x}{\cot x}\, dx$

14. $\displaystyle \int \frac{1}{x^2\sqrt{16x^2 - 9}}\, dx$

15. $\displaystyle \int 2x^3 \cos\left(x^2\right) dx$

16. $\displaystyle \int \tan^5 x \, dx$

17. $\displaystyle \int e^t \sqrt{9 - e^{2t}}\, dt$

18. $\displaystyle \int \frac{x^5}{\sqrt{1 - x^3}}\, dx$

19. $\displaystyle \int \frac{1 - \tan^2 \theta}{\sec^2 \theta}\, d\theta$

20. $\displaystyle \int_1^2 5x^4 (\ln x)^2\, dx$

21. $\displaystyle \int \frac{x}{x^2 + 2x + 2}\, dx$

Answers

1. $-\dfrac{1}{2}\cos\left(t^2\right)+C$

2. $\dfrac{1}{4}t^2-\dfrac{1}{2}t\sin t\cos t+\dfrac{1}{4}\sin^2 t+C$

3. $\dfrac{1}{4}\sin^{-1}(2x)+\dfrac{x}{2}\sqrt{1-4x^2}+C$

4. $-\dfrac{1}{12}\left(1-4x^2\right)^{3/2}+C$

5. $\frac{x^2}{2}+\ln|x|+C$

6. $\sqrt{-y^2+2y+8}+C$

7. $\sin^{-1}\left(\dfrac{y-1}{3}\right)+C$

8. $\dfrac{1}{6}\ln\left|\dfrac{y+2}{y-4}\right|+C$

9. $\sin^{-1}\left(\dfrac{y-1}{3}\right)+\sqrt{-y^2+2y+8}+C$

10. $x\ln\left(\dfrac{x-2}{x+1}\right)-2\ln|x-2|-\ln|x+1|+C$

11. $\sin x(\ln(\sin x)-1)+C$

12. $\dfrac{9}{5}\ln|x-3|+\dfrac{16}{5}\ln|x+2|+\dfrac{4}{x+2}+C$

13. $\dfrac{1}{2}\tan^2 x+C$

14. $\dfrac{\sqrt{16x^2-9}}{9x}+C$

15. $x^2\sin\left(x^2\right)+\cos\left(x^2\right)+C$

16. $\frac{1}{4}\sec^4 x-\sec^2 x-\ln|\cos x|+C$ or
    $\frac{1}{4}\sec^4 x-\tan^2 x-\ln|\cos x|+C$

17. $\dfrac{9}{2}\sin^{-1}\left(\dfrac{1}{3}e^t\right)+\dfrac{1}{2}e^t\sqrt{9-e^{2t}}+C$

18. $-\frac{2}{3}x^3\sqrt{1-x^3}-\frac{4}{9}\left(1-x^3\right)^{3/2}+C$

19. $\sin\theta\cos\theta+C$

20. $32\left(\ln 2\right)^2-\dfrac{64}{5}\ln 2+\dfrac{62}{25}$

21. $\dfrac{1}{2}\ln\left(x^2+2x+2\right)-\tan^{-1}(x+1)+C$