

# Math 141

## More Integration Practice

For each of the following integrals, decide what method to use. After you've made your educated guesses, go back and try them out.

1)  $\int \frac{\tan x}{\cos^4 x} dx$

2)  $\int x^2 \sin 3x dx$

3)  $\int \frac{\sqrt{9-4t^2}}{t^2} dt$

4)  $\int \frac{t}{\sqrt{9-4t^2}} dt$

5)  $\int \frac{\ln x}{\sqrt{x}} dx$

6)  $\int \frac{\cos(\sin^{-1} x)}{\sqrt{1-x^2}} dx$

7)  $\int \frac{2t^3 + 2t + 1}{t(t^2 + 1)^2} dx$

8)  $\int \frac{4x^2 - 7}{2x + 3} dx$

9)  $\int \sin^5 x \cos^2 x dx$

10)  $\int \frac{x}{1 + \sqrt{x}} dx$

11)  $\int \ln(3x - 2) dx$

12)  $\int_0^{\frac{3\pi}{4}} \sqrt{1 + \cos 2\theta} d\theta$

13)  $\int \frac{dt}{t^4 + 4t^2 + 3}$

14)  $\int \frac{dy}{y^2 - 2y + 5}$

15)  $\int e^x \cos 2x dx$

16)  $\int e^{3t} \sin(2e^{3t}) dt$

17)  $\int \frac{9}{81 - v^4} dv$

18)  $\int 3x\sqrt{2x+1} dx$

19)  $\int \frac{1}{\sin^4 y} dy$

20)  $\int \frac{1}{\sqrt{5-4x-x^2}} dx$

21)  $\int \frac{t}{9+t^4} dt$

22)  $\int \frac{dv}{\sqrt{e^{2v}-1}}$

23)  $\int \frac{1}{e^x + e^{-x}} dx$

24)  $\int \frac{1}{t^3 \sqrt{t^2-3}} dt$

25)  $\int \sec^{-1} x dx$

26)  $\int x^3 e^{x^2} dx$

## Answers

- 1)  $\frac{1}{4} \sec^4 x + C$
- 2)  $\left(\frac{2}{27} - \frac{x^2}{3}\right) \cos 3x + \frac{2x}{9} \sin 3x + C$
- 3)  $\frac{-\sqrt{9-4t^2}}{t} - 2 \sin^{-1}\left(\frac{2t}{3}\right) + C$
- 4)  $-\frac{1}{4} \sqrt{9-4t^2} + C$
- 5)  $2\sqrt{x}(\ln x - 2) + C$
- Note: You don't need trig sub for # 4.
- 6)  $x + C$
- 7)  $\ln \left| \frac{t}{\sqrt{t^2+1}} \right| + 2 \tan^{-1} t + \frac{1}{2(t^2+1)} + C$
- 8)  $x^2 - 3x + \ln |2x+3| + C$
- 9)  $\cos^3 x \left(-\frac{1}{7} \cos^4 x + \frac{2}{5} \cos^2 x - \frac{1}{3}\right) + C$
- 10)  $\frac{2}{3} x^{3/2} - x + 2\sqrt{x} - 2 \ln(1 + \sqrt{x}) + C$
- 11)  $(x - \frac{2}{3}) \ln(3x - 2) - x + C$
- 12)  $2\sqrt{2} - 1$
- 13)  $\frac{1}{2} \tan^{-1} t - \frac{\sqrt{3}}{6} \tan^{-1}\left(\frac{t}{\sqrt{3}}\right) + C$
- 14)  $\frac{1}{2} \tan^{-1}\left(\frac{y-1}{2}\right) + C$
- 15)  $\frac{1}{5} e^x \cos 2x + \frac{2}{5} e^x \sin 2x + C$
- 16)  $-\frac{1}{6} \cos(2e^{3t}) + C$
- 17)  $\frac{1}{12} \ln \left| \frac{3+v}{3-v} \right| + \frac{1}{6} \tan^{-1}\left(\frac{v}{3}\right) + C$
- 18)  $\frac{1}{5} (2x+1)^{3/2} (3x-1) + C$
- 19)  $-\cot y - \frac{1}{3} \cot^3 y + C$
- 20)  $\sin^{-1}\left(\frac{x+2}{3}\right) + C$
- 21)  $\frac{1}{6} \tan^{-1}\left(\frac{t^2}{3}\right) + C$
- 22)  $\sec^{-1}(e^v) + C = \tan^{-1} \sqrt{e^{2v} - 1} + C$
- 23)  $\tan^{-1}(e^x) + C$
- 24)  $\frac{1}{6\sqrt{3}} \sec^{-1}\left(\frac{t}{\sqrt{3}}\right) + \frac{\sqrt{t^2-3}}{6t^2} + C$
- 25)  $x \sec^{-1} x - \ln(x + \sqrt{x^2-1}) + C$
- 26)  $\frac{1}{2} (x^2-1)e^{x^2} + C$