

Review for Gateway (Exam No. 1 on February 15, 2010)

1. $\int 4^x + x^4 dx$

Solution: $\frac{4^x}{\ln(4)} + \frac{x^5}{5} + C$

2. $\int \frac{1}{\sqrt[4]{x}} (x^\pi - x^{-\pi}) dx$

Solution: $\frac{4}{4\pi + 3} x^{\pi+3/4} + \frac{4}{4\pi - 3} x^{-\pi+3/4} + C$

3. $\int \frac{1}{t(\ln t)^2} dt$

Solution: $-\frac{1}{\ln(t)} + C$

4. $\int x^3 e^x dx$

Solution: $x^3 e^x - 3x^2 e^x + 6x e^x - 6e^x + C$

5. $\int x^3 e^{x^4} dx$

Solution: $\frac{e^{x^4}}{4} + C$

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

Solution: $\frac{x^2 e^x}{2} - \frac{e^{x^2}}{2} + C$

7. $\int \frac{3p^2 + 11p + 8}{p^3 + 4p^2 + 4p} dp$

Solution: $2 \ln |p| + \ln |p + 2| - \frac{1}{p + 2} + C$

8. $\int \frac{x^3 - x^2 - 1}{x^3 + x} dx$

Solution: $x - \ln |x| - \arctan(x) + C$

9. $\int \frac{1}{\sqrt{5-t^2}} dt$

Solution: $\arcsin\left(\frac{t}{\sqrt{5}}\right) + C$

10. $\int \frac{1}{\sqrt{3-t^2+2t}} dt$

Solution: $\arcsin\left(\frac{t}{2} - \frac{1}{2}\right) + C$

11. $\int \frac{1+3x}{x^2+2x+5} dx$

Solution: $\frac{3}{2} \ln(x^2+2x+5) - \arctan\left(\frac{x}{2} - \frac{1}{2}\right) + C$

12. $\int \theta^3 \cos(\theta^2) d\theta$

Solution: $\frac{\cos(\theta^2)}{2} + \frac{\theta^2 \sin(\theta^2)}{2} + C$

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

Solution: $-\frac{2}{5}e^x \cos(2x) + \frac{1}{5}e^x \sin(2x) + C$

14. $\int \frac{w^3+5w^2+7w-11}{w^2+6w+13} dw$

Solution: $\frac{w^2}{2} - w + \arctan\left(\frac{w}{2} + \frac{3}{2}\right) + C$

15. $\int \frac{x^{26}}{x^{54}+4} dx$

Solution: $\frac{1}{54} \arctan\left(\frac{x^{27}}{2}\right) + C$

16. $\int (\ln(x^7))^2 dx$

Solution: $49x(\ln(x))^2 - 98x \ln(x) + 98x + C$