# Solutions of Self-test 1 of Chapter 3

1. **Chapter 4 Review Exercises 4.** $\int \frac{4}{x^2}dx = 4\int x^{-2} = -4x^{-1} + c$.

2. **Chapter 4 Review Exercises 8.** $\int 3\sqrt{x}dx = 3\int x^{1/2} = 2x^{3/2} + c$.

3. **Chapter 4 Review Exercises 10.** $u = x^2+4, du = 2xdx, xdx = \frac{1}{2}du$. $\int \frac{x}{x^2+4}dx = \frac{1}{2}\int \frac{1}{u}du = \frac{1}{2}\ln|u| + c = \frac{1}{2}\ln|x^2+4| + c$.

4. **Chapter 4 Review Exercises 15.** $u = x^3, du = 3x^2dx, x^2dx = \frac{1}{3}du$. $\int 6x^2\cos x^3 dx = 3\int \cos u du = 3\sin u + c = 3\sin x^3 + c$.

5. **Chapter 4 Review Exercises 18.** $u = \ln x, du = \frac{1}{x}dx$. $\int \frac{\ln x}{x}dx = \int u du = \frac{1}{2}u^2 + c = \frac{1}{2}(\ln x)^2 + c$.

6. **Chapter 4 Review Exercises 19.** $u = \cos x, du = -\sin x dx$. $\int \tan x dx = -\int \frac{1}{u}du = -\ln|u| + c = -\ln|\cos x| + c$.

7. **Chapter 4 Review Exercises 41.** The intersection points with $x$ axis are 0 and 3 which are obtained by setting $3x - x^2 = 0$. So $A = \int_0^3 (3x - x^2)dx = \left(\frac{3}{2}x^2 - \frac{1}{3}x^3\right)_0^3 = \frac{3}{2}3^2 - \frac{1}{3}3^3 = \frac{9}{2}$.

8. **Chapter 4 Review Exercises 48.** $\int_{-1}^1 (x^3 - 2x)dx = \left(\frac{1}{4}x^4 - x^3\right)_{-1}^1 = \left(\frac{1}{4}1^4 - 1^3\right) - \left(\frac{1}{4}(-1)^4 - (-1)^3\right) = -2$.

9. **Chapter 4 Review Exercises 52.** $u = -t^2, du = -2tdt, u(0) = 0, u(1) = -1$. $\int_0^1 te^{-t^2}dt = -\frac{1}{2}\int_0^{-1} e^u du = \frac{1}{2}\int_{-1}^0 e^u du = e^u|_{-1}^0 = 1 - e^{-1}$.

10. **Chapter 4 Review Exercises 58.** $u = x/2, du = dx/2, u(-\pi) = -\pi/2, u(\pi) = \pi/2$. $\int_{-\pi}^{\pi} \cos(x/2)dx = 2\int_{-\pi/2}^{\pi/2} \cos u du = \sin u|_{-\pi/2}^{\pi/2} = \sin(\pi/2) - \sin(-\pi/2) = 2$.

11. **Chapter 4 Review Exercises 60.** $f'(x) = \sqrt{x^4+1}2x = 2x\sqrt{x^4+1}$.