

1 Symmetry

1.1 Concepts

1. A function is called **even** if $f(x) = f(-x)$ and **odd** if $f(x) = -f(-x)$. For an even function $\int_{-a}^a f(x)dx = 2 \int_0^a f(x)dx$. For an odd function, $\int_{-a}^a f(x)dx = 0$.

1.2 Problems

2. True False An even function is symmetric across the y axis.
3. True False An odd function is symmetric across the x axis.
4. Is $f(x) = x^3 + x$ even, odd, or neither?
5. Is $f(x) = \sqrt{1 - x^4}$ even, odd, or neither?
6. Is $f(x) = x^5 + x^2$ even, odd, or neither?
7. Is $f(x) = \frac{x}{x^2 + 1}$ even, odd, or neither?

2 Integration by Parts

8. True False Integration by parts will automatically give the antiderivative of a function.
9. Find $\int \arctan(x)dx$.
10. Find $\int \sin(x) \cos(x)dx$.
11. Integrate $\int x \ln x dx$.
12. Integrate $\int \frac{\ln x}{x^5} dx$.
13. Integrate $\int (\ln x)^2 dx$.

14. Integrate $\int x(\sin x + \cos x)dx$.

15. Integrate $\int_{\tan(1)}^{\tan(e)} \frac{\ln(\arctan(x))}{1+x^2} dx$.

16. Integrate $\int_{\pi/4}^{\arctan(e)} \sec^2(x) \ln(\tan(x)) dx$.