Preface

Here are a set of problems for my Calculus I notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.

As with the set of practice problems I write these as I get the time and some sections will have only a few problems at this point and others won’t have any problems in them yet. Rest assured that I’m always trying to get more problems written but this site has been written and maintained in my spare time and so I usually cannot devote as much time as I’d like to the site.

The Definition of the Definite Integral

For problems 1 – 4 use the definition of the definite integral to evaluate the integral. Use the right end point of each interval for \( x_i^* \).

1. \( \int_{-2}^{1} 7 - 4x \, dx \)

2. \( \int_{0}^{2} 3x^2 + 4x \, dx \)

3. \( \int_{-1}^{1} (x - 3)^2 \, dx \)

4. \( \int_{0}^{3} 8x^3 + 3x - 2 \, dx \)

5. Evaluate: \( \int_{-123}^{123} \cos^6(2x) - \sin^8(4x) \, dx \)

For problems 6 – 8 determine the value of the given integral given that \( \int_{-2}^{5} f(x) \, dx = 1 \) and \( \int_{-2}^{5} g(x) \, dx = 8 \).
6. $\int_{-2}^{5} -3g(x) \, dx$

7. $\int_{-2}^{5} 7f(x) - \frac{1}{4} g(x) \, dx$

8. $\int_{5}^{2} 12g(x) - 3f(x) \, dx$

9. Determine the value of $\int_{7}^{-1} f(x) \, dx$ given that $\int_{13}^{7} f(x) \, dx = -9$ and $\int_{13}^{-1} f(x) \, dx = -12$.

10. Determine the value of $\int_{6}^{10} 4f(x) \, dx$ given that $\int_{6}^{5} f(x) \, dx = 10$ and $\int_{6}^{5} f(x) \, dx = 3$.

11. Determine the value of $\int_{2}^{10} f(x) \, dx$ given that $\int_{2}^{4} f(x) \, dx = -1$, $\int_{4}^{7} f(x) \, dx = 3$ and $\int_{7}^{10} f(x) \, dx = -8$.

12. Determine the value of $\int_{-5}^{10} f(x) \, dx$ given that $\int_{-5}^{2} f(x) \, dx = 56$, $\int_{2}^{7} f(x) \, dx = -90$ and $\int_{7}^{10} f(x) \, dx = 45$.

For problems 13 – 17 sketch the graph of the integrand and use the area interpretation of the definite integral to determine the value of the integral.

13. $\int_{-2}^{1} 12 - 5x \, dx$

14. $\int_{0}^{4} \sqrt{16 - x^2} \, dx$

15. $\int_{-3}^{3} 5 - \sqrt{9 - x^2} \, dx$

16. $\int_{-1}^{3} 8x - 3 \, dx$

17. $\int_{1}^{6} |x - 3| \, dx$

For problems 18 – 23 differentiate each of the following integrals with respect to $x$. 

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18. $\int_{\pi}^{\pi} e^{\cos(t)} \, dt$

19. $\int_{\pi}^{\pi} \sqrt{\cos(t) + 3} \, dt$

20. $\int_{0}^{\infty} \frac{1}{t^4 + t^2 + 1} \, dt$

21. $\int_{\sin(9\pi)}^{\infty} \frac{e^t}{7t} \, dt$

22. $\int_{\pi}^{\pi} \cos^4(t) - \sin^2(t) \, dt$

23. $\int_{\gamma(\pi)}^{\tan(\pi)} \frac{\cos(t) + 2}{\sin(t) + 4} \, dt$