

Review Sheet for Meaning of Integration Test

Antiderivatives

1. $\int \frac{3}{(2x)^4} dx$

2. $\int \sec^2 x dx$

3. $\int (x^{-1} + \csc x \cdot \cot x) dx$

4. $\int \frac{e}{1+x^2} dx$

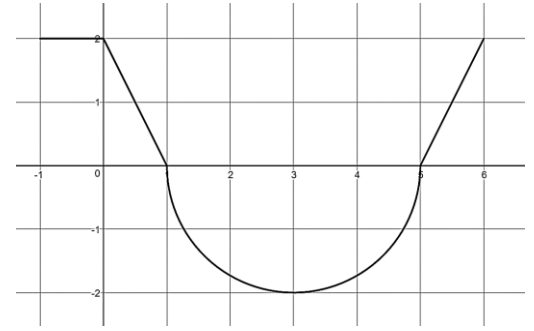
5. $\int \frac{1}{\sec^2 x} dx$

6. $\int \frac{5x^3 - 3\sqrt{x}}{\sqrt[3]{x^2}} dx$

7. A particle moves so that its acceleration is $a(t) = 3t^2 - t - 6$. The velocity at $t = 1$ is 2.5 m/sec . Its position at time $t = 0$ is 5 meters. Find both the velocity function and the position function.

8. Explain the meaning of $\int_{10}^{60} r(t) dt$ if $r(t)$ is the rate of change in the amount of oil in a tanker in gallons per minute measured from $t = 0$ is $8:00 \text{ am}$

9. a. Find the area under the curve of $f(x)$ from $[-1,6]$
 b. Find $\int_1^6 f(x) dx$



10.

x	0	10	20	30	40	50	60	70	80
$f(x)$	-42	-37	-33	-25	-22	-15	-13	-9	-2

- a. Use a Right Riemann Sum with 4 subintervals to estimate $\int_0^{80} f(x)dx$
- b. Use a midpoint Riemann estimate with 4 subintervals.
- c. Use a trapezoid estimate with 8 subintervals.

11. Find the following given the integral below:

$$\int_0^2 (x^2 + 2x - 3)dx$$

- a. A midpoint Riemann sum with 4 subintervals
- b. A trapezoid sum with 4 subintervals
- c. The actual value of the integral

12. Express the limit as a definite integral on the given interval and evaluate.

a. $\lim_{n \rightarrow \infty} \sum_{i=0}^n [2(x_i^*)^2 - 5(x_i^*)] \Delta x$ on $[0,1]$

b. $\lim_{n \rightarrow \infty} \sum_{i=0}^n [5(x_i^*)^2 - 2(x_i^*)] \Delta x$ on $[-1,2]$

c. $\lim_{n \rightarrow \infty} \sum_{i=0}^n \left[\frac{1}{(x_i^*)} \right] \Delta x$ on $[1,4]$

13. The expression $\frac{1}{50} \left(\sqrt{\frac{1}{50}} + \sqrt{\frac{2}{50}} + \sqrt{\frac{3}{50}} + \dots + \sqrt{\frac{50}{50}} \right)$ is the Riemann sum approximation for

a. $\int_0^1 \sqrt{\frac{x}{50}} dx$ b. $\int_0^1 \sqrt{x} dx$ c. $\frac{1}{50} \int_0^1 \sqrt{\frac{x}{50}} dx$ d. $\frac{1}{50} \int_0^1 \sqrt{x} dx$ e. $\frac{1}{50} \int_0^{50} \sqrt{x} dx$

14. A particle moves with acceleration $a(t) = 5 + 4t - 2t^2 \text{ m/s}^2$. Find the velocity function and the position function if $v(0) = 3 \text{ m/s}$ and $s(0) = 10 \text{ m}$.

15. Let $f(t)$ be the rate at which oil is being pumped into a holding tank in *gal/min*.

Approximate $\int_0^{70} f(t) dt$ using (including units)

a. Right Riemann sum with 4 subintervals

t	$f(t)$
0	25
30	35
40	40
50	55
70	60

b. Trapezoids with 4 subintervals

c. Using your approximation in part b. If there were originally 3500 gallons of oil in the holding tank, how many gallons are in the tank after 70 minutes?

$$16. \int_6^{10} dx$$

$$17. \int_{-2}^4 \left(\frac{x}{2} + 3\right) dx$$

$$18. \int_{-\frac{\pi}{2}}^{\frac{\pi}{4}} \frac{1}{\cos^2 x} dx$$

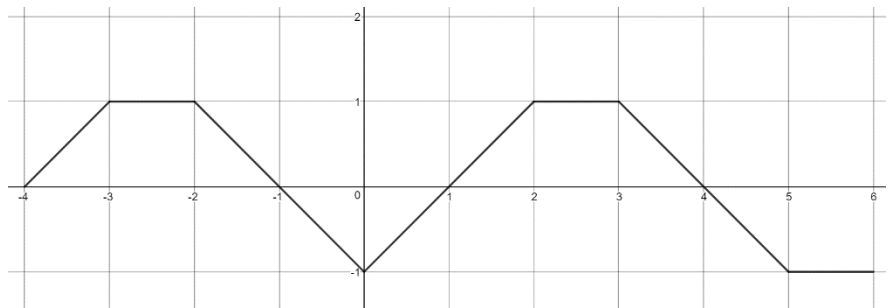
$$19. \int_{\frac{\sqrt{3}}{3}}^1 \frac{2}{1+x^2} dx$$

$$20. \int_8^{27} \frac{dx}{\sqrt[3]{x}}$$

$$21. \int_{-1}^7 |5-x| dx$$

22. Let $g(x) = \int_{-3}^x f(t) dt$, where f is the function whose graph is shown below:

a. Find $g(0)$



b. Find $g'(0)$

c. At what value(s) of x does g attain a local maximum and/or local minimum?

d. Sketch a graph of $g(x)$

23. Suppose $\int_1^9 f(x) dx = -1$, $\int_7^9 f(x) dx = 5$, $\int_7^9 h(x) dx = 4$ Find the following:

a. $\int_1^9 -2f(x) dx$ b. $\int_7^9 [2f(x) - 3h(x)] dx$ c. $\int_9^7 h(x) dx$ d. $\int_9^9 h(x) dx$ e. $\int_1^7 f(x) dx$

24. On a particular day, suppose that t hours after midnight, the outside temperature is changing at a rate $r(t) = 5\cos(0.05t^2 + 2)$ degrees Fahrenheit per hour. If the temperature is $72^\circ F$ at 10 a.m., what is the temperature at 1 p.m.? Set up and use your calculator to evaluate.

25. The temperature of a tank of water is changing at a rate of $r(t) = e^{\sqrt{t}} - 6$ degrees F/hour , where the time t is in hours. Suppose the temperature of the water at $t = 0$ is $56^\circ F$. Find the temperature at $t = 4$

For each problem, find $F'(x)$.

26. $F(x) = \int_x^{x^2} 4(t-2)^{\frac{1}{2}} dt$

27. $F(x) = \int_x^3 (t^2 + 2t + 2) dt$

28. $F(x) = \int_x^{2x} \frac{5}{t^3} dt$

29. $F(x) = \int_{3x^4}^{x^2} 2 \csc^2 t dt$

30. $F(x) = \int_x^{2\cos x} 2(t-2)^{\frac{1}{2}} dt$

31. $F(x) = \int_{3x}^{4x^2} 2 \cos t dt$

$$32. \quad F(x) = \int_x^{x^2} \frac{3}{(t+2)^2} dt$$

$$33. \quad F(x) = \int_{\sin x}^{\cos x} e^t dt$$

$$34. \quad F(x) = \int_2^x \sec^2 t dt$$

$$35. \quad F(x) = \int_2^{x^2} \sqrt{-3t} \cdot e^{t-2} dt$$