

Sample Problems for Exam Four

1. Evaluate $\sum_{i=1}^n i^3 - i^2$ in general and for $n = 20$.
2. Compute the area under $y = x^2$ from $x = 0$ to $x = 2$ as a limit of (right) Riemann sums.
3. Find the (left) Riemann sum which approximates $\int_1^3 2^x dx$ with n subintervals of equal length, in general and for $n = 4$.
4. If $\int_0^3 f(x)dx = 12$ and $\int_0^6 f(x)dx = 52$, find $\int_3^6 f(x)dx$.
5. Let $f(x) = \int_1^{x^{1/3}} \frac{e^t}{t} dt$. Find $f'(1)$.
6. Let $f(x) = \int_0^x \frac{4-t^2}{1+\cos^2 t} dt$. Where does f have a local maximum?
7. Evaluate $\int_0^1 (1 + \sqrt{x})^2 dx$.
8. Evaluate $\int_1^3 12x^3 - 4x + 2 dx$.
9. Evaluate $\int_0^{\frac{1}{2}} \frac{dx}{\sqrt{1-x^2}}$.
10. Evaluate $\int_{\sqrt{e}}^{e^5} \frac{dx}{x \ln x}$.
11. Evaluate $\int \frac{e^x}{(e^x+2)^2} dx$.
12. Evaluate $\int_2^3 \frac{x}{x-1} dx$.
13. Evaluate $\int_{-\pi}^{\frac{\pi}{3}} f(x)dx$, where $f(x) = -x$, if $x \leq 0$ and $= \sin 3x$, if $x \geq 0$ – sketch the area.
14. A ball is thrown upwards from the top of a 160 foot tall building with initial velocity $v_0 = 80$ feet per second and subject to gravity at -32 feet per second. Find the velocity $v(t)$ and position $s(t)$ after time t . Find the maximum height of the ball, the duration of the flight and the velocity at impact.
15. A point moves along the x -axis with acceleration given by $a(t) = 1 - 1/t^2$. If $v(1) = 1$ and $s(1) = 0$, find $v(t)$, $s(t)$, and the net and total distance traveled between $t = 1$ and $t = 3$ seconds.
16. A population $P(t)$ of bacteria doubles every 6 hours. Find the population $P(t)$ given that $P(0) = 200$. Find the rate of growth k such that $P' = kP$.
17. The element Gatrion decays subject to the differential equation $G' = -.002P$. Find a formula for $P(t)$ given $P(0) = 5mg$. Find the half-life for Gatrion.