# CALCULUS I REVIEW

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## 3. Integration

(1) Evaluate the integral:

(a) $\int_0^1 (3-6x^5)\,dx$

(b) $\int_0^1 (1-x)^5\,dx$

(c) $\int_0^1 \sin(2\pi x)\,dx$

(d) $\int \frac{x^3}{x^4+1}\,dx$

(e) $\int_1^4 \frac{3t^2-\sqrt{t}}{t}\,dt$

(f) $\int \sin x \cos(\cos x)\,dx$

(g) $\int \frac{e^{\sqrt{t}}}{\sqrt{t}}\,dt$

(h) $\int \frac{\cos(\ln x)}{x}\,dx$

(2) Evaluate:

(a) $\frac{d}{dx}\int_0^1 e^{x^3}\,dx$

(b) $\frac{d}{dx}\int_e^x e^{t^3}\,dt$

(c) $\int_0^1 \frac{d}{dx}e^{x^3}\,dx$

(d) $\frac{d}{dx}\int_\pi^{x^2} e^{t^3}\,dt$

(3) Find the derivative of the function:

(a) $F(x) = \int_{\sin x}^1 \sqrt{\cos t}\,dt$

(b) $G(x) = \int_{\sqrt{x}}^x e^t\,dt$

(4) Consider $\int_0^3 (2x+3x^2)\,dx$.

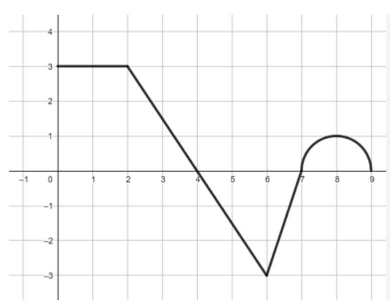
(a) Estimate the above integral using Riemann sum with three subintervals, taking the sample points to be left endpoints.

(b) Write the above integral as a limit of Riemann sums, taking the sample points to be right endpoints and evaluate the sum.

(c) Check your answer using the Fundamental Theorem of Calculus.

(5) Determine the value of the integral $\int_1^2 (4f(x)-2x)\,dx$ given that $\int_{-1}^0 f(x)\,dx = 5$, $\int_{-1}^1 f(x)\,dx = 10$, and $\int_0^2 f(x)\,dx = 24$.

(6) Use the graph of a function $f$ below to evaluate $\int_0^9 f(x)\,dx$.




(7) Find the area of the region bounded by:

(a) $y = \frac{1}{x}$, $y = x^2$, $y = 0$, $x = e$.

(b) $x + y = 0$, $x = y^2 + 3y$.