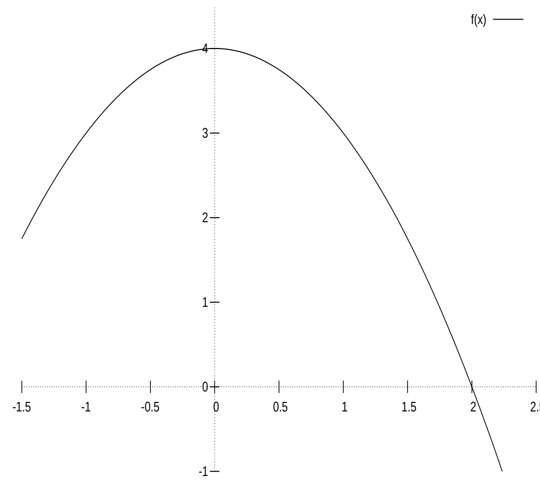
1. Contemplate this graph of a function $f(x)$. Let $g(x) = \int_0^x f(t)\,dt$. Then for $0 < x < 2$, $g(x)$ is:

(a) Increasing and concave up

(b) Increasing and concave down

(c) Decreasing and concave up

(d) Decreasing and concave down



2. Let $f(x) = x^3 + 3$ on the interval $[1, 5]$.

(a) What is the area between the graph of $f(x)$ and the x axis on this interval?

(b) Draw the graph of $f(x)$ and shade the area you just computed in (a).

(c) Divide $[1, 5]$ into 4 subintervals and compute the left and right Riemann sums. How do these compare to your answer for (a)?

3. Evaluate the following definite integrals:

(a) $\displaystyle\int_0^5 (x^2 - 9)\,dx$ (b) $\displaystyle\int_0^{\pi/4} 2\cos(t)\,dt$ (c) $\displaystyle\int_1^{\sqrt{3}} \frac{1}{1+y^2}\,dy$

4. Simplify the following expressions:

(a) $\displaystyle\frac{d}{dx}\int_3^x (t^2 - 12t + 4)\,dt$ (b) $\displaystyle\frac{d}{dx}\int_0^x \sqrt{q^9 + 6q}\,dq$

(c) $\displaystyle\frac{d}{dx}\int_{-8}^{2x^3} e^y\,dy$ (d) $\displaystyle\frac{d}{dx}\int_{e^x}^{e^{2x}} \ln(t^2)\,dt$

(e) $\displaystyle\frac{d}{dx}\int_2^{\cos(x)} \frac{dr}{r^2}$ (f) $\displaystyle\frac{d}{dx}\int_0^{x^2-2x} \frac{x^{s-1}\,dy}{\Gamma(s)(e^y - 1)}$