4. (10 points) Give the definition of the improper integral $\displaystyle\int_1^\infty \frac{1}{x^{3/2}}\,dx$. Then use your definition to evaluate the integral if it converges, or else show it diverges.

5. (12 points). Evaluate the integrals, given that $f(x)$ is a continuous function for $0 \le x \le 6$ with the following
properties:

$$f(0)=2,\quad f(2)=3,\quad f(4)=-1,\quad f(6)=5; \qquad f'(0)=1,\quad f'(2)=4;$$
$$\int_0^2 f(x)\,dx=3,\quad \int_2^4 f(x)\,dx=1,\quad \int_4^6 f(x)\,dx=6.$$

(a) $\displaystyle\int_0^2 xf'(x)\,dx =$ _____.

(b) $\displaystyle\int_2^4 f'(x)\big(2+3f(x)\big)\,dx =$ _____.

(c) $\displaystyle\int_0^2 f(3x)\,dx =$ _____.