

L'Hôpital's rule

1. Use l'Hôpital's rule to find the following.

(a) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\ln x}$

(b) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$

With k a constant, find $\lim_{x \rightarrow \infty} \left(1 + \frac{k}{x}\right)^x$.

Integration

3. Evaluate.

(a) $\int (x\sqrt{x} - 3) dx$

(b) $\int_{-5}^{-3} \frac{1}{t} dt$

(c) $\int_{-1}^1 \frac{1}{1+x^2} dx$

4. (a) Find $(x \ln x - x)'$.

(b) Find $\int_1^e \ln x dx$.

5. Find

$$\frac{d}{dx} \int_x^{x^2} \cos(t^2) dt.$$