

Calculus 1 Assignment 5

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Due Wednesday, March 6th at 5 pm

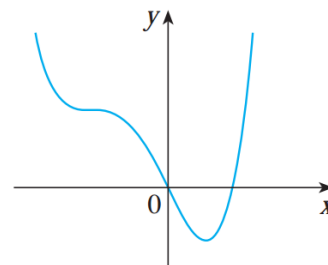
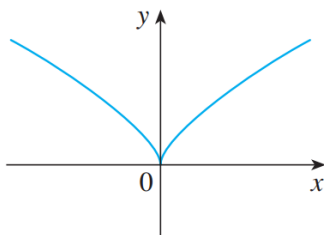
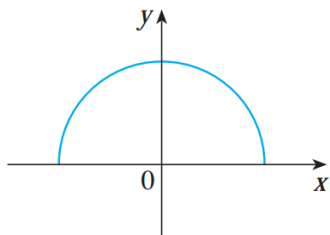
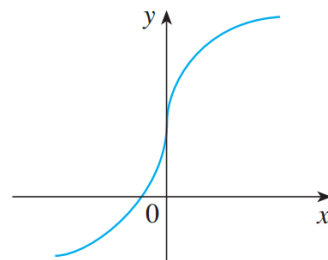
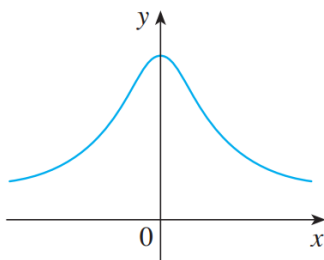
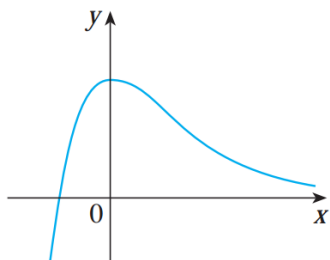
1. Differentiate the following functions with respect to x :

a) $(e^x + x)^3$
b) $\frac{\log(x\sqrt{x})}{x^2} + q$
c) $\sqrt{x}e^{\sqrt{x}}$
d) $\frac{t \sin x}{1+(\sin x)^2}$

e) $(\tan x)^{-\frac{1}{n}}$
f) $\cos(\arcsin x)$
g) $\sqrt{1-x^2}$
h) $\log(f(x))$ (for arbitrary f)

i) e^{x^2}
j) $(e^{x^2})'$
k) $(e^{x^2})''$

2. Redraw the following functions and sketch their derivatives next to them:



3. Let

$$f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}, \quad g(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}, \quad \text{and} \quad h(x) = \begin{cases} x^2 & \text{if } x \text{ is rational} \\ 0 & \text{if } x \text{ is irrational} \end{cases}.$$

What are $f'(0)$, $g'(0)$, and $h'(0)$?

4. The function T satisfies

$$T(0.8) = -0.2231, \quad T(0.9) = -0.1054, \quad T(0.95) = -0.0512, \quad T(0.98) = -0.0202, \quad T(0.99) = -0.0101, \\ T(1.01) = 0.0099, \quad T(1.02) = 0.0198, \quad T(1.05) = 0.0487, \quad T(1.1) = 0.0953, \quad \text{and} \quad T(1.2) = 0.1823.$$

Estimate $T'(1)$.