Exercise 1 Write the composite function $y = \sin(\cot(x))$ in the form $f(g(x))$. Identify the inner function $u = g(x)$ and the outer function $y = f(u)$. Then find the derivative dy/dx.

Exercise 2 Find the derivative of the function.

(a) $F(x) = (1 + x + x^2)^{99}$

(b) $f(x) = \dfrac{1}{\sqrt[3]{x^2 - 1}}$

(c) $g(\theta) = \cos^2(\theta)$

(d) $g(x) = e^{x^2 - x}$

(e) $F(t) = (3t - 1)^4(2t + 1)^{-3}$

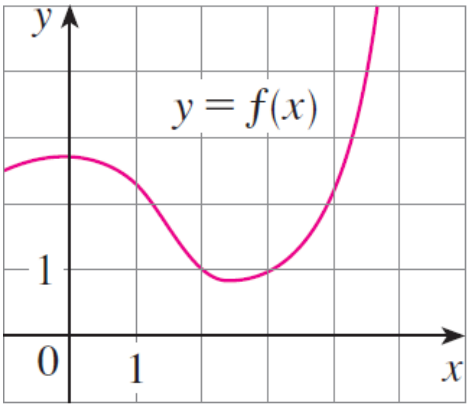
(f) $y = \left(x + \dfrac{1}{x}\right)^5$

(g) $s(t) = \sqrt{\dfrac{1 + \sin(t)}{1 + \cos(t)}}$

(h) $y = \sqrt{1 + xe^{-2x}}$

Exercise 3 At what point on the curve $y = \sqrt{1+2x}$ is the tangent line perpendicular to the line $6x + 2y = 1$?

Exercise 4 If f is the function whose graph is shown, let $h(x) = f(f(x))$ and $g(x) = f(x^2)$. Use the graph of f to estimate the value of each derivative.



(a) $h'(2)$

(b) $g'(2)$

Exercise 5 Air is being pumped into a spherical weather balloon. At any time t, the volume of the balloon is $V(t)$ and its radius is $r(t)$.

(a) What do the derivatives dV/dr and dV/dt represent?

(b) Express dV/dt in terms of dr/dt.