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# Worksheet 08

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1. Let  $f(x) = x^3 e^x - 7 + \sqrt{x}$

(a) Find  $f'(x)$ .

(b) Find  $f''(x)$ .

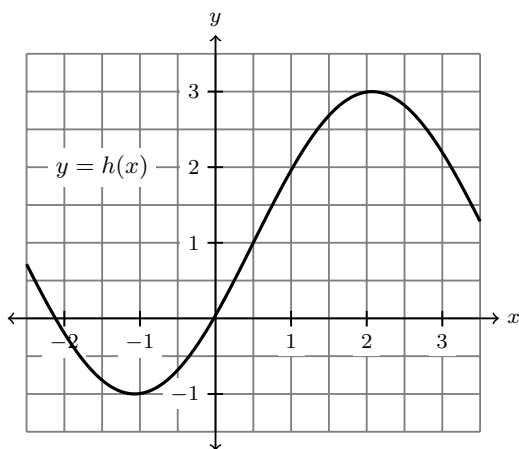
2. Suppose that  $h(x)$  is function for which  $h'(x) = x^2 h(x)$  and  $h(2) = 10$ .

(a) Find  $h'(2)$ .

(b) Find  $h''(2)$ .

3. Find the derivative of  $f(x) = \frac{\sqrt{x} + xe^x}{e^x - x}$

4. Let  $f(x) = \frac{x^2}{h(x)}$  where the graph of  $y = h(x)$  is below. Find  $f'(1)$ .



5. Follow the steps below to *prove* the quotient rule:  $\left(\frac{f(x)}{g(x)}\right)' = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$ .

We will let  $h(x) = \frac{f(x)}{g(x)}$ . This means that we are looking for a formula for  $h'(x)$ .

(a) Solving for  $f(x)$ , we have  $f(x) = h(x)g(x)$ . Now use the product rule to write an expression for  $f'(x)$

$$f'(x) =$$

(b) Take your expression for  $f'(x)$ , and solve for  $h'(x)$  (in terms of  $f'(x)$ ,  $g(x)$ ,  $g'(x)$ , and  $h(x)$ ).

$$h'(x) =$$

(c) Take your expression for  $h'(x)$ , and substitute in  $\frac{f(x)}{g(x)}$  for  $h(x)$ . Simplify, until you get the quotient rule.

$$h'(x) =$$