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# Derivatives of Polynomials and Exponential Functions

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Solutions should show all of your work, not just a single final answer.

1. Use differentiation rules from Section 3.1 (**not other methods**) to compute the derivative of the following functions.

(a)  $f(x) = 7x^3 - 5x + 8$

(b)  $f(x) = e^x + x^e$

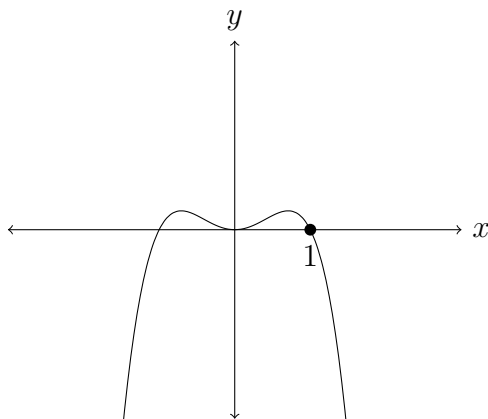
(c)  $f(x) = 3x + \sqrt{3x}$

(d)  $f(x) = \sqrt[4]{x} - 4e^x$

(e)  $f(x) = \frac{x^2 + 4x + 3}{\sqrt{x}}$

(f)  $f(x) = \frac{12}{x^5} - \frac{7}{\sqrt[5]{x}}$

2. Use differentiation rules to find the equation of the tangent line to  $y = x^2 - x^4$  (see below) at the point  $(1, 0)$ .



3. Use differentiation rules to find the values of  $a$  and  $b$  that make the function

$$f(x) = \begin{cases} x^2 & \text{if } x \leq 2, \\ ax^3 + bx & \text{if } x > 2 \end{cases}$$

differentiable at  $x = 2$ .

4. Find all points  $(c, f(c))$  on the graph of  $f(x) = x^3 - 3x^2$  where the tangent line has slope 9.
5. T/F (with justification) If  $f(x) = \sqrt{7}$  for all  $x$ , then  $f'(x) = \frac{1}{2\sqrt{7}}$  for all  $x$ .