WORKSHEET 6

MATH 101

Fulbright University, Ho Chi Minh City, Vietnam

Question 1. *Given the limit, find the function $f(x)$ and the point a so that the limit is the derivative of $f(x)$ at $x = a$.*

(1) $\lim_{h\to 0} \dfrac{(1+h)^{2/3} - 1}{h}$

(2) $\lim_{h\to 0} \dfrac{\cos(\pi + h) + 1}{h}$

Date: September 16, 2024.

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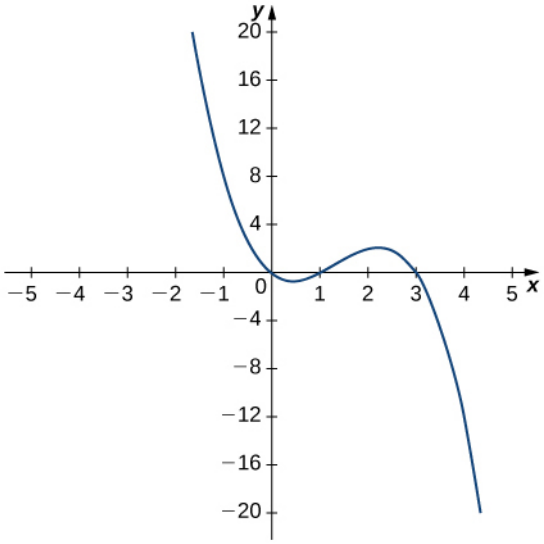
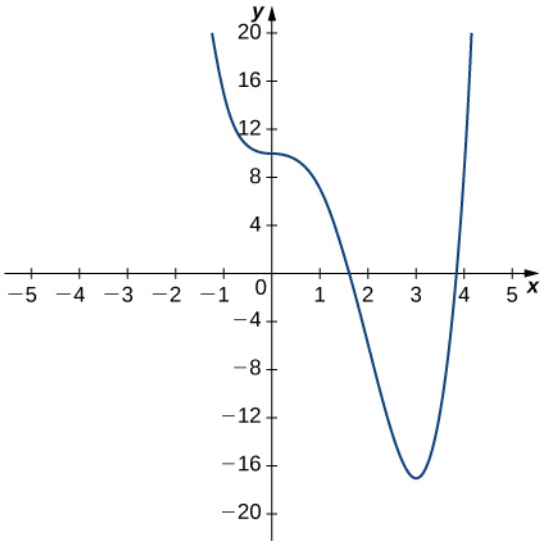
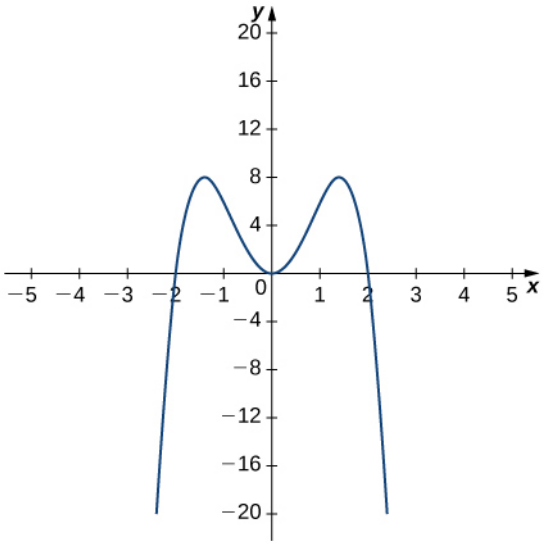
Question 2. *Sketch the graphs of the derivatives of the following functions given by the graphs below.*



(1)



(2)



(3)

Question 3. *Show that*

(1) If $f(x) = x^n$*, then* $f'(x) = nx^{n-1}$

(2) $(f'(x) + g(x))' = f'(x) + g'(x)$

(3) $(f'(x) - g(x))' = f'(x) - g'(x)$

(4) $(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$

(5) $\left(\dfrac{f(x)}{g(x)}\right)' = \dfrac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$

Question 4. *Apply the above rules when*

$$f(x) = x^3 - \pi x$$

and

$$g(x) = \frac{1}{x^2 + 3}$$

Question 5. *Show the chain rule:*

$$\frac{d}{dx} f(g(x)) = f'(g(x))g'(x)\,.$$