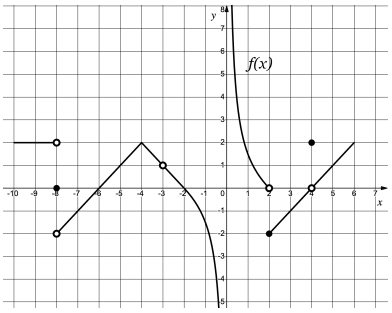
Final Exam Review – Derivatives

Openstax Sections: 3.1-3.9.

Exercises

- Using the limit definition, no other method, compute:
  1. $\dfrac{dy}{dx}$ for $y = \dfrac{1}{2x}$
  2. $y'(2)$ for $y = \sqrt{x-1}$

- The graph of $f(x)$ is shown below. On the same graph, with a different color, make a rough sketch of f'.



- The functions g and h have the following values and derivatives:

x	$g(x)$	$g'(x)$	$h(x)$	$h'(x)$
1	-1	3	0	2

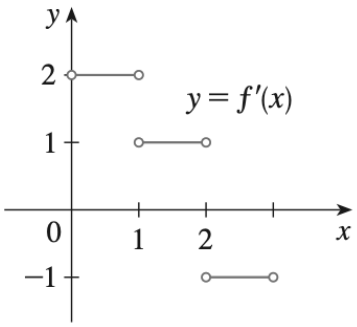
  Using the table above, compute $f'(1)$ for each of the following:

  1. $f(x) = h(\sqrt{x})$
  2. $f(x) = \dfrac{g(x)}{h(x) + g(x)}$
  3. $f = e^x g(x)$

- Find y':

1. $y = (x^2 + 1)^{1785}$
2. $y = \dfrac{\sqrt{x} + x^2 + 3}{x}$
3. $y = x \arcsin(x)$
4. $y = \ln(\sec x)$
5. $y = \sin^2(\cos(\sin \pi x))$
6. $xe^y = y \sin x$
7. $y = 4^{x \ln x}$
8. $y = \tan\left(\dfrac{x}{1 + x^2}\right)$
9. $y = (\cos x)^x$
10. $y = \dfrac{\sqrt{x+1}(2+x)^3}{(1+x^2)^{10}}$

- The graph of $f'(x)$ is shown below. On the same graph, with a different color, sketch the graph of f, given that f is continuous on $[0, 3]$ and $f(0) = 0$.



- Find $y^{(1785)}\left(\frac{\pi}{3}\right)$, the one thousand seven hundred eighty-fifth derivative of y at $x = \frac{\pi}{3}$, of $y = \cos(x)$.
- Find the equation of the tangent line to the curve $x^2 + 4xy + y^2 = 13$ at $(2, 1)$.
- Let $y = x^3 + 2x - 8$. Find the slope of the tangent line to the inverse function y^{-1} at the point $(4, 2)$, i.e. $\dfrac{d}{dx} y^{-1}(x)\Big|_{x=4}$.
- Two points on the graph of

$$f(x) = x^3 - 3x^2 + 3x + 1785$$

are separated horizontally by 1 unit and have parallel tangents. What is the largest x-coordinate of the two points?