

Homework Set 18

The Tangent Line
(sections 2.2 – 2.6, 3.3, & 3.5)

1. The graph of the function $f(x)$ is given below. Use it to find the following derivatives of f .

$$f'(-2) =$$

$$f'(-1) =$$

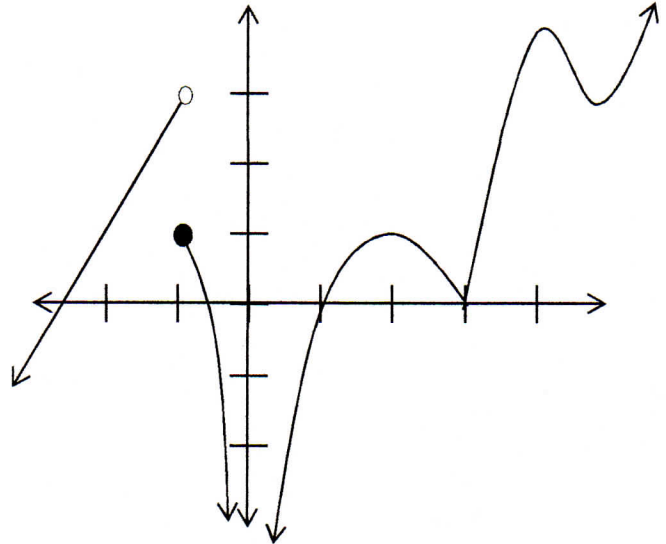
$$f'(0) =$$

$$f'(1) =$$

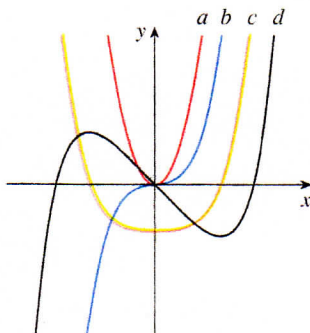
$$f'(2) =$$

$$f'(3) =$$

$$f'(4) =$$



2. The figure below shows the graphs of the functions f , f' , f'' , and f''' . Identify each curve and explain your choices.



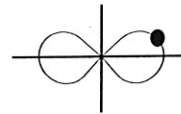
For questions 3 – 6, find the equation of the line tangent to the function or equation at the given point.

3. $f(x) = x - \sqrt{x}$ at $(1, 0)$

4. $f(x) = \frac{e^x}{x}$ at $(1, e)$

5. $y = x \ln(\tan x)$ at $(\frac{\pi}{4}, 0)$

6. A lemniscate: $2(x^2 + y^2)^2 = 25(x^2 - y^2)$ at $(3, 1)$



7. For what values of x does the curve $y = 2x^3 + 3x^2 - 12x + 1$ have a horizontal tangent?

8. Show that the curve $y = 6x^3 + 5x - 3$ has no tangent line with a slope of 4.

9. The curve $y = \frac{x}{1+x^2}$ is called a serpentine.
- Find an equation of the tangent line to this curve at the point $(3,0.3)$.
 - At which points does this curve have a horizontal tangent?
 - Illustrate parts (a) by graphing the curve and its tangent line.

10. The curve $y^2 = x^3 + 3x^2$ is called the Tschirnhausen cubic.
- Find an equation of the tangent line to this curve at the point $(1, -2)$.
 - At which points does this curve have a horizontal tangent?
 - Illustrate parts (a) and (b) by graphing the curve and its tangents.