

Review

This review sheet should NOT serve as your only review. You should review all notes and tests.

Questions 1 through 7 refer to the graph of $y = f(x)$ shown to the right.

1. $\lim_{x \rightarrow 1^-} f(x) =$

2. $\lim_{x \rightarrow 1^+} f(x) =$

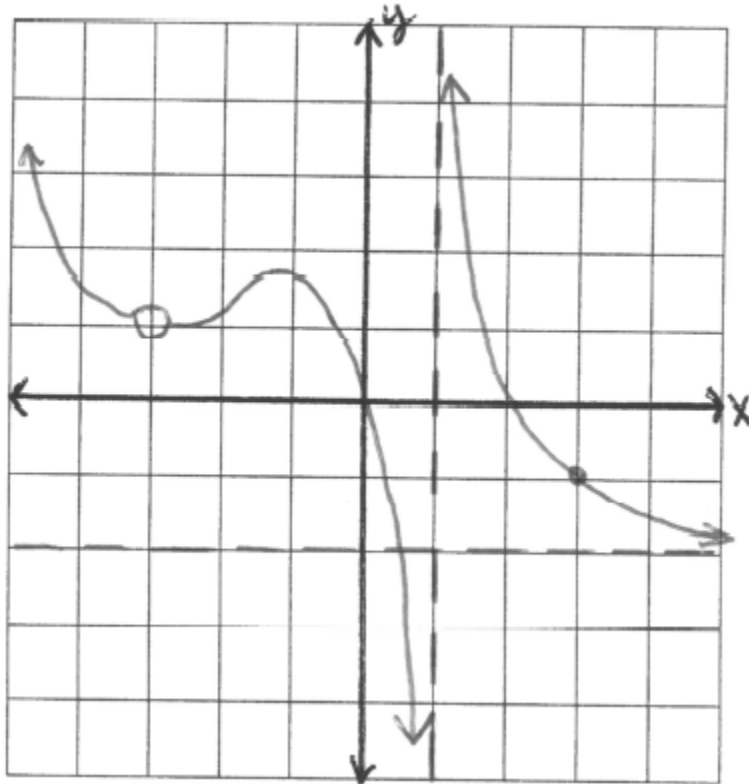
3. $\lim_{x \rightarrow 1} f(x) =$

4. $\lim_{x \rightarrow -3} f(x) =$

5. $\lim_{x \rightarrow 3} f(x) =$

6. $\lim_{x \rightarrow -\infty} f(x) =$

7. $\lim_{x \rightarrow \infty} f(x) =$



For each of the following functions, use the definition of derivative to find $f'(x)$.

$$\text{Recall: } f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

8. $f(x) = 2x^2 - 8x + 5$

9. $f(x) = \sqrt{3x+1}$

Find the derivative of each of the following:

10. $f(x) = 5x + 2\sqrt[3]{x} - \frac{3}{x^2}$

11. $f(x) = \sin^2(3x+1)$

12. $f(x) = \ln(\sin x)$

13. $f(x) = \ln(\sqrt{2x+3})$

14. $f(x) = \frac{e^{2x}}{x^2}$

15. $f(x) = \sqrt[4]{(x^2+5x)^3}$

16. $f(x) = \sqrt{x} \tan x$

17. $f(x) = x^3 \sec(e^{3x}-1)$

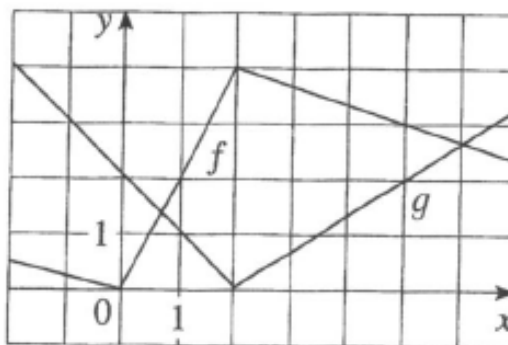
18. $f(x) = e^{\sqrt{2x}}$

19. Find the slope of the line tangent to $y = x^2 \ln(3x)$ when $x = 1$.

20. Write the equation of the line tangent to $y = 3x^2 - 2x + 1$ when $x = -1$.
21. Write the equation of the line tangent to $y = 5 - x^2$ when $x = 2$.
22. An object moves along a line so that its position at time t is given by $s(t) = 2t^3 - 15t^2 + 24t - 10$ where $t \geq 0$.
- What is the object's position at time $t = 3$?
 - What is the object's velocity at time $t = 3$?
 - What is the object's acceleration at time $t = 3$?
 - Is the object speeding up or slowing down at $t = 3$? Justify your response.
 - When is the object at rest?
 - When is the object moving right?
 - How far does the object travel in the first 3 seconds?

23. If f and g are the functions shown below. Let $h(x) = f(g(x))$ and $s(x) = f(x)g(x)$.

Find: $h'(1)$ and $s'(1)$



24. The following table records the values of f , f' , g , and g' at $x = 1$, $x = 2$, and $x = 3$.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	1	2	3
2	5	4	3	4
3	0	6	-1	-2

If $n(x) = \frac{f(x)}{g(x)}$, $h(x) = f(g(x))$, find the value of each of the following: a) $n'(2)$ b) $h'(1)$

25. If $f(x) = \sqrt[3]{(x^2 - 2x - 1)^2}$, then $f'(0) =$

28. Find $\frac{dy}{dx}$ for the given curve: $x^3 + y^3 = 18y$

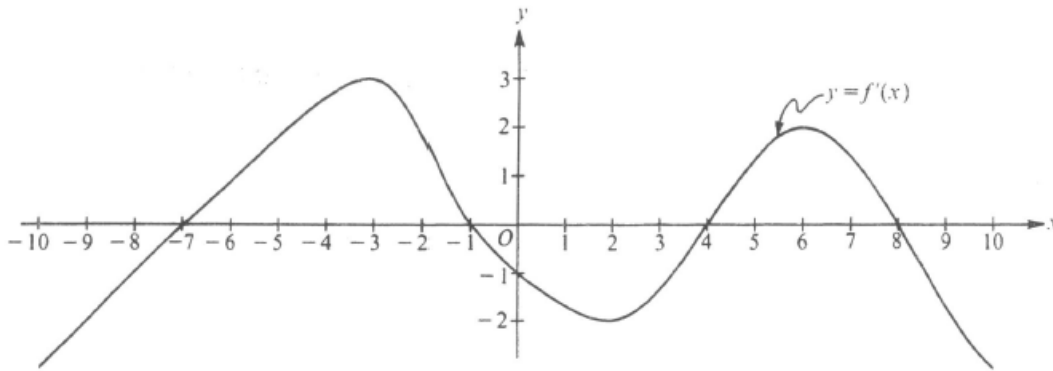
29. Find $\frac{dy}{dx}$ for the given curve: $x^2y - xy^2 = 4x$

30. Write the equation of the tangent to $x^2 - xy = y^2 + 1$ in the first quadrant when $y = 1$.

33. Given the function $f(x) = x^4 - 4x^3$, find:

- the zeros of the function
- the critical points and the intervals of increasing and decreasing.
- Any possible inflection points and intervals of concave up or concave down.
- Finally, sketch the graph. Use your analysis from the 1st and 2nd derivative tests and the zeros you found.

34.



Note: This is the graph of the derivative of f , not the graph of f .

The figure above shows the graph of f' , the derivative of a function f . The domain of f is the set of all real numbers x such that $-10 \leq x \leq 10$.

- For what values of x does the graph of f have a horizontal tangent?
- For what values of x in the interval $(-10, 10)$ does f have a relative maximum?
Justify your answer.
- For what values of x is the graph of f concave downward?