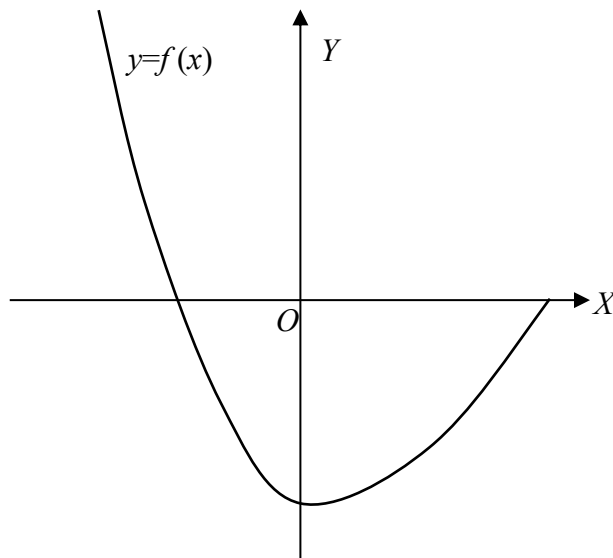


## Review Questions

These questions are just some review questions. Notice that the format and the questions of your midterm are not necessarily the same as these review questions.

1. Find the domain of the function  $f(x) = \frac{\sqrt{x^2 - x}}{\ln(2 + x)}$ .
2. Find the intersection points of the graphs of  $y = x^2 - 3x + 2$  and  $y = 2x^2 - x - 1$ .
3. Consider the function  $f(x) = \frac{2x}{x - 3}$ . Find the horizontal/vertical asymptote(s) of this graph, if any.
4. The following figure gives the graph of a function  $y = f(x)$ . Sketch the graph of the function  $y = -f(1 - 2x)$ .



5. Let  $f(x) = \frac{x}{x+1}$  and  $g(x) = 2x - 1$ . Find  $(f \circ g)(2)$ ,  $(f \circ f)(2)$ , and  $f^{-1}(2)$ .
6. Which one of the following equalities is an identity?
  - (A)  $\sin(2x) = 2 \sin x$ .
  - (B)  $\sin^2 x = 2 \sin x$ .
  - (C)  $\sin x + \sin y = \sin(x + y)$ .
  - (D)  $\cos(2x) = \cos x + \sin x$ .
  - (E)  $2\sin^2 x = 1 + \cos(2x)$ .
  - (F) None of the above.

7. Solve the following equations:

(a)  $\log_2(x+2) - \log_2(2x-1) = 1$ .

(b)  $\log_2(x+1) + \log_2(2x-1) = 1$ .

(c)  $3^{2x-1} = 5^x$ .

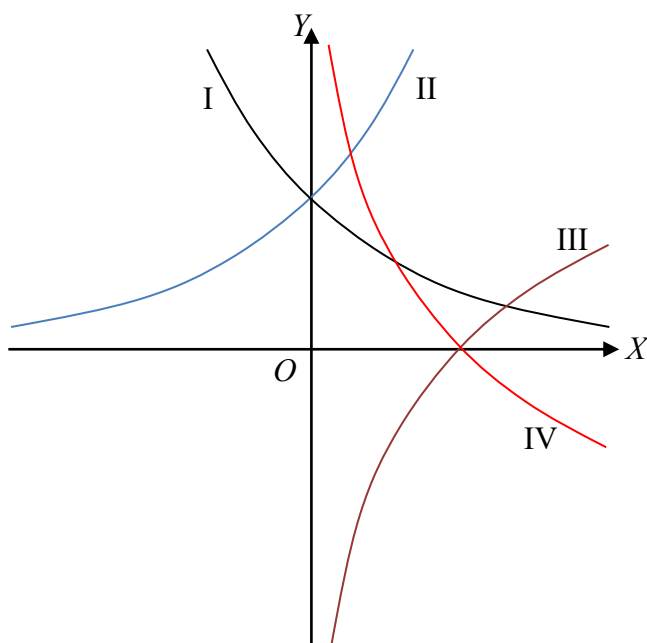
8. Match the following graphs and functions:

(a)  $y = 2^x$ ;

(b)  $y = \left(\frac{1}{2}\right)^x$ ;

(c)  $y = \log_2 x$ ;

(d)  $y = \log_{(1/2)} x$ .



9. Find the following limits:

(a)  $\lim_{x \rightarrow 0} \frac{1}{x} (\sqrt{1-2a} - \sqrt{1-2(a+x)})$ .

(b)  $\lim_{x \rightarrow 1} \frac{1}{x-1} \left( \frac{1}{x+1} - \frac{2}{x+3} \right)$ .

(c)  $\lim_{x \rightarrow 1^-} \frac{|x^2 - 1|}{x^2 + x - 2}$ .

10. Let  $f(x) = \frac{2x^2 - x - 1}{x^2 - 1}$ . Find the following limits:

- (a)  $\lim_{x \rightarrow \infty} f(x)$ ;      (b)  $\lim_{x \rightarrow -\infty} f(x)$ ;      (c)  $\lim_{x \rightarrow -1^-} f(x)$ ;  
(d)  $\lim_{x \rightarrow -1^+} f(x)$ ;      (e)  $\lim_{x \rightarrow 1^-} f(x)$ ;      (f)  $\lim_{x \rightarrow 1^+} f(x)$ .

11. For which values of  $a$  and  $b$ , is the function

$$f(x) = \begin{cases} ax + b, & x < 2 \\ 2b - x, & 2 \leq x \leq 5 \\ x^2 - ax + b, & 5 \leq x \end{cases}$$

continuous for all values of  $x$ ?

12. Find the derivative of the function  $y = \frac{1}{x^3}$  at the point where  $x = 2$  by definition.

13. Let  $f(x) = xe^{-2\sqrt{x}}$ . For which value(s) of  $x$  does the graph of  $f(x)$  have a horizontal tangent line?

14. Find the derivative of the function  $y = \frac{\sin(\pi x/2)}{x}$  at  $x=1$ .

15. Suppose a function  $y = f(x)$  is defined implicitly by the equation  $x^2y^2 + x^3 - y^2 + y = 1$  near a point  $(-1, 2)$ . Find the equation of the tangent line of the graph of this equation at point  $(-1, 2)$ .