

**Instructions: This is a list of some material that is essential prerequisite for this course. That is, your instructor expects that you have a definite idea of the notions expounded below and that you be able to solve the problems below without any review. If you find yourself having trouble on some items below you should seek immediate help from your instructor or from the tutors in the Learning Laboratory.**

Essential prerequisites include:

- |  |  |
|--|--|
| (a) Graphing quadratic curves.   | (d) Completion of the square.                |
| (b) Knowing elementary exponential, logarithmic, and trigonometric identities. | (e) Knowing the basic differentiation rules. |
| (c) Manipulation of algebraic fractions.                                       | (f) Knowing the basics of integration.       |
|  | (g) Knowing integration by substitution.     |

You should be able to quickly answer all questions below without needing any review.

1. Make a rough sketch of

$$\frac{(x-2)^2}{9} + \frac{(y+1)^2}{4} = 1.$$

2. Graph the curve with equation  $|x^2 - y^2| = 1$ .

3. Sketch the curve  $y = |x - 1|$  and then find

$$\int_{-1}^2 |x - 1| dx.$$

4. Graph  $y = \cos x$  in the interval  $[-\frac{\pi}{2}; \pi]$  and then find  $\int_{-\pi/2}^{\pi} \cos x dx$ .

5. Find  $\frac{dy}{dx}$ :

(a) $y = \frac{x+1}{x-1}$	(c) $y = \frac{1}{\sqrt{4-x^2}}$
(b) $y = \sec(2x)$	(d) $y = x^3 e^{3x}$

6. Add:  $-\frac{2}{x} - \frac{2}{x^2} + \frac{2}{x-2}$ .

7. Show that  $\sqrt{1+x^{-2/3}} = x^{-1/3} \sqrt{1+x^{2/3}}$ .

8. Factor:  $4x^2 - 12x + 9$ .

9. Find the exact value of:

(a) $\arccos \frac{1}{2}$
(b) $\arcsin \frac{1}{2}$

10. If  $\frac{\pi}{2} < x < \pi$  and  $\sin x = \frac{1}{2}$ , find  $\tan x$ .

11. If  $0 < \theta < \frac{\pi}{2}$  and  $\tan \theta = \frac{1}{x}$ , find  $\cos \theta$ .

12. Evaluate the following limits:

(a) $\lim_{x \rightarrow 2^-} \frac{(x-1)(x-2)}{x+2}$	(c) $\lim_{x \rightarrow 0} \frac{\sin 2x}{\tan 3x}$
(b) $\lim_{x \rightarrow 0^+} 1 - \cos(2x)$	(d) $\lim_{x \rightarrow -1} \frac{x^2 - 1}{x + 1}$

13. Consider the graph of  $y = f(x)$ . Find the following.

- |                                      |   |
|--------------------------------------|---|
| (a) $f(1)$                           | (e) $\lim_{x \rightarrow -\infty} f(x)$ |
| (b) $f(3)$                           | (f) $\lim_{x \rightarrow 3^-} f(x)$     |
| (c) $\lim_{x \rightarrow 1} f(x)$    | (g) $\lim_{x \rightarrow 3^+} f(x)$     |
| (d) $\lim_{x \rightarrow -1^+} f(x)$ |   |

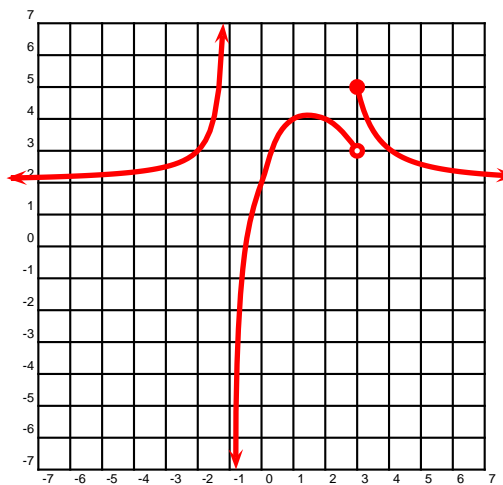


Figure 1: Problem 13.

14. Find  $\int (\sin x) e^{\cos x} dx$ .

15. Find constants  $A, a, B, b$  such that  $\sin x \cos 2x = A \sin ax + B \sin bx$ .

16. Prove that  $2 \sec x = \frac{\cos x}{1 - \sin x} + \frac{\cos x}{1 + \sin x}$  and use it to find  $\int \sec x dx$ .

17. Find  $\int \sqrt{\frac{1-x}{1+x}} dx$ .

18. Find constants  $A, a, b$  such that  $x^2 + 6x + 10 = A(x+a)^2 + b^2$ . Graph the curve  $y = x^2 + 6x + 10$  and identify its intercepts and its minimum point.