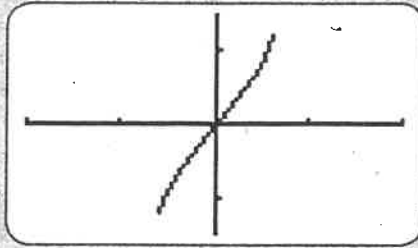
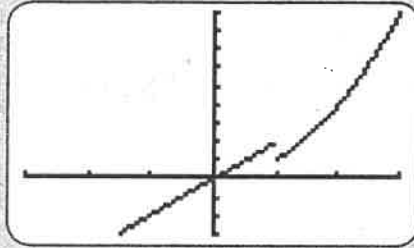


(c) Domain =  $[-1, 1]$ , range =  $[-\frac{\pi}{2}, \frac{\pi}{2}]$



$x [-\pi, \pi], y [-1.5, 1.5]$

(d) Domain = {all real numbers}, range = {all real numbers}



$x [-3, 3], y [-3, 9]$

## Exercises

### Multiple Choice Questions

No calculator is allowed for these questions.

1. The zeros of the polynomial function

$$f(x) = x^4 - 3x^3 \text{ are}$$

- (A) 0 and 3
- (B) 0 only
- (C) 3 only
- (D) 3 and 4

2.  $\text{Arctan } \sqrt{3}$  is equal to

- (A) 1
- (B)  $\frac{\pi}{4}$
- (C)  $\frac{\pi}{6}$
- (D)  $\frac{\pi}{3}$

3. Find the number of solutions of the equation  $\cos^2 x - 1 = 0$  for values of  $x$  in the interval  $[0, 2\pi]$ .

- (A) 0
- (B) 1
- (C) 2
- (D) 3

4. Solve for  $x$ :  $e^{2x} = 9$ .

- (A)  $\ln 9$
- (B)  $\ln 4.5$
- (C)  $\ln 3$
- (D)  $\pm 4.5$

5. Find the range of the piecewise function

$$\text{defined by } f(x) = \begin{cases} (x-1)^2, & x < 1 \\ 2x-3, & x > 1 \end{cases}$$

- (A) {all real numbers}  
(B)  $\{y > -1\}$   
(C)  $\{y \geq -1\}$   
(D)  $\{y \neq 1\}$

6. Find the equation of the horizontal asymptote of  $y = \frac{5x}{x-1}$ .

$$y = \frac{5x}{x-1}$$

- (A)  $y = 0$   
(B)  $x = 1$   
(C)  $x = 5$   
(D)  $y = 5$

7. Find the equation of the vertical asymptote of

$$y = \frac{5x}{x-1}$$

- (A)  $y = 1$   
(B)  $y = 0$   
(C)  $x = 1$   
(D)  $x = 5$

8. Given  $f(x) = 2x - 3$ , find  $f(x+h)$ .

- (A)  $2x + 2h - 3$   
(B)  $2x + h - 3$   
(C)  $x + h$   
(D)  $x + h - 3$

9. If  $f(x) = (2x-1)(x^2+1)(x-5)^2$ , then  $f(x)$  has how many real roots?

- (A) 0  
(B) 1  
(C) 2  
(D) 3

10. Solve for  $x$ :  $\log_9 x^2 = 9$ .

- (A) 1  
(B)  $3^3$   
(C)  $3^9$   
(D)  $\pm 3^9$

11.  $2 \ln e^{5x} =$

- (A)  $10x$   
(B)  $5x^2$   
(C)  $25x^2$   
(D)  $e^{10x}$

12. The values of  $x$  that are solutions to the equation  $\cos^2 x = \sin 2x$  in the interval  $[0, \pi]$  are:

- (A)  $\arctan \frac{1}{2}$  only.  
(B)  $\arctan \frac{1}{2}$  and  $\pi$ .  
(C)  $\arctan \frac{1}{2}$  and 0.  
(D)  $\arctan \frac{1}{2}$  and  $\frac{\pi}{2}$ .

13. The graph of  $f(x) = \frac{x^2-1}{x-1}$  has

- (A) a hole at  $x = 1$ .  
(B) a hole at  $x = -1$ .  
(C) a vertical asymptote at  $x = 1$ .  
(D) a vertical asymptote at  $x = -1$ .

14. If  $\ln x^2 = 6$ , then  $x =$

- (A)  $\pm e^6$   
(B)  $9^{\sqrt{6}}$   
(C)  $e^{\sqrt{6}}$   
(D)  $\pm e^3$

### Free Response Questions

A graphing calculator is required for some questions.

- Find the domain and range and sketch the graph of  $y = e^{\ln x}$ .
- The rational function  $y = \frac{ax}{bx+c}$  has a vertical asymptote at  $x = 2$  and a horizontal asymptote at  $y = 3$ .
  - Find  $a$  and  $c$  in terms of  $b$ , and express  $y$  in simplest form.
  - Graph the function, showing the vertical and horizontal asymptotes.
- Write a piecewise function that has domain = {all real numbers} and range =  $\{y \neq 2\}$ .
- Solve the trigonometric equation  $4 \sin^2 x - \cos x = 1$  for values of  $x$  in the interval  $(0, \pi)$ .

5. For each of the following functions, graph  $f(x)$ ,  $|f(x)|$ , and  $f(|x|)$ . Using these graphs, write a statement about the relationship between the graphs of  $f(x)$ ,  $|f(x)|$ , and  $f(|x|)$ .

(a)  $f(x) = \cos x$

(b)  $f(x) = \sin x$

(c)  $f(x) = x^2 - 2x$

6. (a) Write a fourth-degree polynomial that has roots 3 and  $1 - i$ . (There is more than one correct solution.)
- (b) Write a rational function that has a vertical asymptote at  $x = 1$ , a horizontal asymptote at  $y = 2$ , and a hole at  $x = -1$ .