

Part I. Problems in this section are mostly short answer and multiple choice. Partial credit will not be given. 4 points each.

1. State the center and the radius of the given circle:

$$(x - 6)^2 + (y + 3)^2 = 15$$

center:

radius:

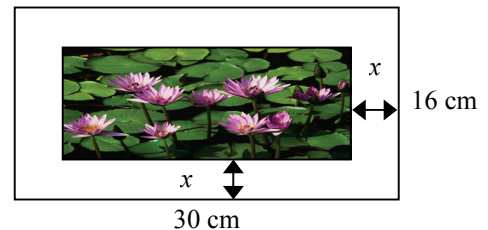
2. Find the domain of the function. $g(x) = x^2 - 7x + 6$

- a) $\{x \mid x \neq -3 \text{ and } x \neq -2\}$
 b) $\{x \mid x \neq 3 \text{ and } x \neq 2\}$
 c) $\{x \mid x \neq 1, \text{ and } x \neq 6\}$
 d) $\{x \mid x \text{ is a real number}\}$

3. Multiply $(3 - 2i)^2$. Simplify your answer. Put your answer in the form $a + bi$.

4. A picture frame measuring 16 cm by 30 cm is shown. Find the area of the picture in terms of x .

- a) $A(x) = 480 - x^2$
 b) $A(x) = (16 - x)(30 - x)$
 c) $A(x) = (2x - 16)(2x - 30)$
 d) $A(x) = (16 - 2x)(30 - 2x)$



5. Let $f(x) = 3x - 1$ and $g(x) = x^2 - 3$

a) Find and simplify $(f - g)(x)$.

b) Find $(f \circ g)(-1)$.

6. Determine the symmetries (if any) of the graph of the given relation.

$$y = x^2 - 2$$

Solutions

Choose the correct symmetry of the graph.

- a) It is symmetric to the x -axis.
 b) It is symmetric to the origin.

- c) It is symmetric to the y -axis.
 d) It has no symmetries.

7. Graph the function: $g(x) = -|x - 2|$
Label all intercepts.

[Solutions](#)

8. The point $(-11, 2)$ is on the graph of $y = f(x)$. Find

- a) a point on the graph of $y = f(x + 2)$.
b) a point on the graph of $-2f(x)$.

9. Solve $R = \frac{1}{2}k(a_1 + a_2)$ for k .

a) $k = 2R - (a_1 + a_2)$

c) $k = \frac{R}{2(a_1 + a_2)}$

b) $k = \frac{2R}{(a_1 + a_2)}$

d) $k = 2R(a_1 + a_2)$

10. Solve: $-3 \leq \frac{2-x}{4} < 1$. Express solution in interval form.

11. Graph both functions using the same set of axes. Label all intercepts.

$$f(x) = e^x, g(x) = \ln x$$

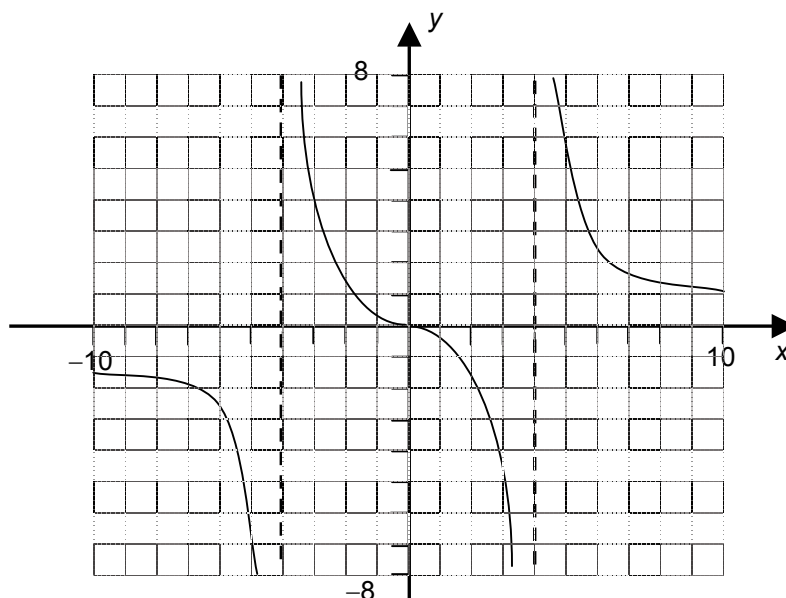
[Solutions](#)

12. A related function is graphed. Solve the given inequality.

$$\frac{9x}{x^2 - 16} \geq 0$$

Which is the solution?

- a) $(-\infty, -4] \cup [0, 4]$
b) $(-\infty, -4) \cup [0, 4)$
c) $[-4, 0] \cup [4, \infty)$
d) $(-4, 0] \cup (4, \infty)$



**Part II. There are 10 problems in this section. Partial credit will be awarded.
Show all work. 12 pts. each.**

13. Let $g(x) = 3x^2 - x + 1$. Find and simplify $g(p-2)$.

$g(p-2) =$ _____

Solutions

14. Find a linear function h given $h(-1) = \frac{1}{2}$ and $h(2) = \frac{1}{3}$.

The linear function is $h(x) =$ _____.

15. Solve: $x^{2/3} - 7x^{1/3} + 12 = 0$

The solution is $x =$ _____.

16. For the function below, find the vertex, the axis of symmetry, and the maximum or minimum value.

$$f(x) = -x^2 + 5x + 6$$

- a) The vertex is (_____, _____).
- b) Choose the correct axis of symmetry.

A. $x = -\frac{5}{2}$ B. $x = \frac{5}{2}$ C. $x = \frac{5}{4}$ D. $x = -\frac{5}{4}$

c) Does $f(x)$ have a maximum or a minimum value?

- Maximum Minimum

d) Minimum/maximum value = _____.

17. Solve for x : $3^{x^2} \cdot 9^x = 27$.

Solutions

18. Sketch the graph of the polynomial function $f(x) = (x-3)^2(2x+5)$. Label all intercepts.

19. Find the quotient and the remainder. $(x^3 - 3x^2 - 4) \div (x-2)$

The quotient is _____ and the remainder is _____.

26. The diagonal of a TV set is 13 inches long. It's length is 7 inches more than the height. Find the dimensions of the TV set. **Do NOT select this problem unless you can set up and solve the related equation.**

Length = _____

Height = _____

27. For $f(x) = 2x - x^2$, construct and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$.

Grade

28. The sales, S , of a product have declined in recent years. There were 2.01 million sold in 1994 and 1.5 million sold in 2004. Assume sales are decreasing according to the exponential decay model, $S(t) = S_0 e^{-kt}$. Find the value of k .

Grade

[Solutions](#)

29. Solve the system algebraically:

Grade

$$x - 2y + 3z = 11$$

$$4x + 2y - 3z = 4$$

$$3x + 3y - z = 4$$

SOLUTIONS

1. Center: $(6, -3)$ Radius: $\sqrt{15}$ 6. c) It is symmetric to the y-axis

2. d) $\{x \mid x \text{ is a real number}\}$

7.

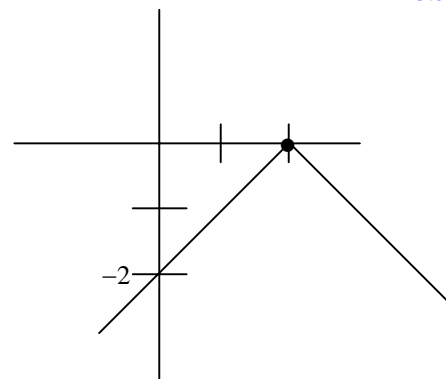
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3. $5 - 12i$

4. d) $A(x) = (16 - 2x)(30 - 2x)$

5. a) $-x^2 + 3x + 2$

- b) $f(-2) = -7$



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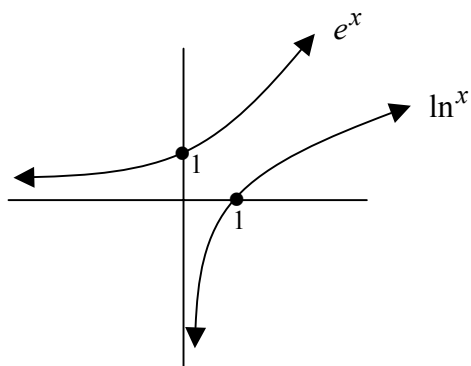
8. a) $(-13, 2)$ b) $(-11, -4)$

9. b) $k = \frac{2R}{(a_1 + a_2)}$

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10. $(-2, 14]$

11.



12. d) $(-4, 0] \cup (4, \infty)$

13. $3p^2 - 13p + 15$

14. $m = -\frac{1}{18}$. The linear function is $h(x) = -\frac{1}{18}x + \frac{4}{9}$

15. The solution is $x = 27, 64$

16. a) The vertex is $\left(\frac{5}{2}, \frac{49}{4}\right)$ b) B. $x = \frac{5}{2}$

[Return to Page 3](#)c) Does $f(x)$ have a maximum or a minimum value? Maximum

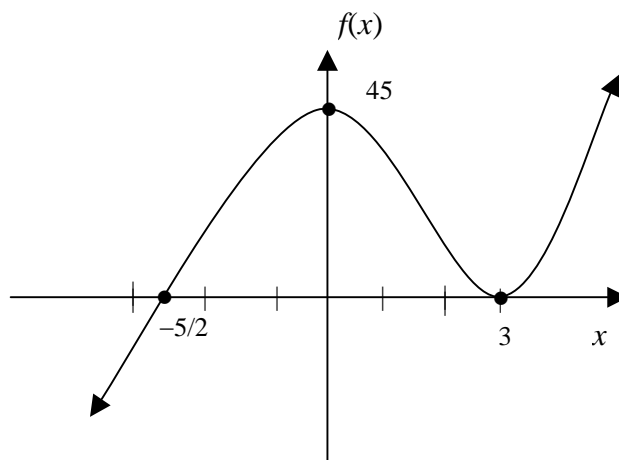
d) Minimum/maximum value = $\frac{49}{4}$

17. $x = 1, -3$

18.

$f(0) = 45$

zeros: $-\frac{5}{2}, 3$

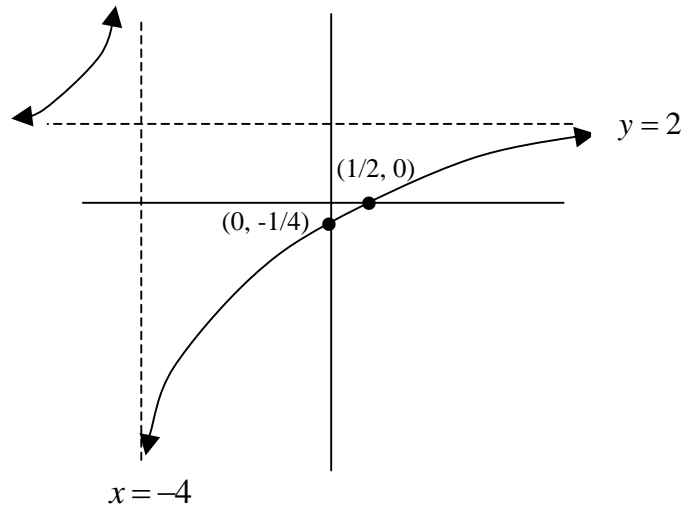
Tangency at $x = 3$ [Return to Page 3](#)19. The quotient is $x^2 - x - 2$ and the remainder is -8 20. The inverse function is $f^{-1}(x) = \frac{x^6 + 1}{2}$

21. $\frac{x-5}{x+3} = 9^{\frac{3}{2}}$ $x = -\frac{43}{13}$

There is no solution, since the LHS of the given equation is undefined when $x = -\frac{43}{13}$.

22. a) The equation of the vertical asymptote(s) is/are $x = -4$.b) The equation of the horizontal asymptote is $y = 2$.c) The graph of $f(x)$ has one x-intercept at the point $(\frac{1}{2}, 0)$.d) The graph of $f(x)$ has one y-intercept at the point $(0, -\frac{1}{4})$.[Return to Page 4](#)

22. e) Sketch the graph $f(x)$. Label all intercepts and asymptotes.



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23. Time to reach Max height $\frac{5}{2}$ sec.

$$\begin{aligned} \text{Max height: } s\left(\frac{5}{2}\right) &= -16\left(\frac{25}{4}\right) + 80\left(\frac{5}{2}\right) \\ &= 100 \text{ ft} \end{aligned}$$

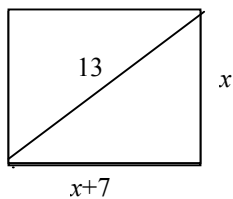
24. $f(x) = (x+3)(x^2 - 3x + 9)$
 $x = -3$
 $x = \frac{3 \pm 3\sqrt{3}i}{2}$

25. $f(x) = (x+2)(x-3i)(x+3i)$

$$f(x) = x^3 + 2x^2 + 9x + 18$$

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26.



$$x^2 + (x+7)^2 = 13^2$$

$$x^2 + 7x - 60 = 0$$

$$\text{Length} = 12$$

$$\text{Height} = 5$$

$$27. \frac{f(x+h) - f(x)}{h} = \frac{2(x+h) - (x+h)^2 - (2x - x^2)}{h} = 2 - 2x - h.$$

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$$28. 1.5 = 2.01e^{-10k}$$

$$k = -\frac{1}{10} \ln \left(\frac{1.5}{2.01} \right)$$

$$29. (3, -1, 2)$$