NOTICE: Course topics change slightly from one semester to the next, so students should always consult with their instructor.

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: $(x-6)^2+(y+3)^2=9$

   center: radius:

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

   a) $\{x|x\neq 0\}$
   b) $\{x\neq 3 \text{ and } x\neq 2\}$
   c) $\{x\,|\,x\neq 1, \text{and } x\neq 6\}$
   d) $\{x\,|\,x \text{ is a real number}\}$

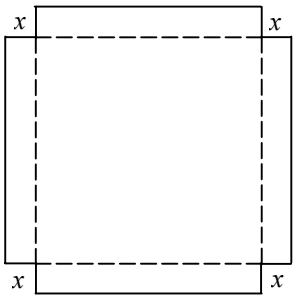
3. Multiply $(3+6i)^2$. Simplify your answer. Put your answer in the form $a+bi$.

4. A piece of sheet metal is 9cm by 9cm. Square corners are cut out so that the sides can be folded up to make a box. Let x represent the length of a cut-out square.

   Which function V represents the volume of the box in terms of x?

   a) $V=x(9-x)^2$ b) $V=x(9-2x)(9-2x)$

   c) $V=81x$ d) $V=x^2(9-2x)$



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

   a) Find and simplify $(f-g)(x)$. b) Find $(f\circ g)(0)$.

6. Graph the function: $g(x)=-|x|$

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

$y = x^3 - 2$

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.

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 $y = f(x) + 2$.

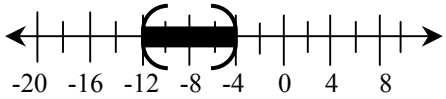
9. Solve for *y*. $x - y = ynk$

The solution is $y =$_____.

10. Solve: $|x+8| \geq 4$

Choose the correct graph of the solution set.

a)



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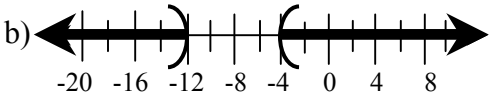

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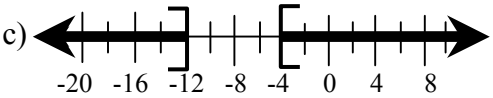
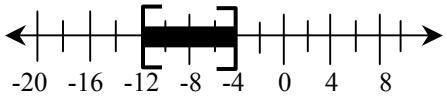


d)



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

$f(x) = 3^x$, $g(x) = \log_3 x$

12. Convert $\log_p R = -z$ to an exponential equation. Choose the correct exponential form.

a) $R^p = -z$ b) $p^R = -z$

c) $-z^R = p$ c) $p^{-z} = R$

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 $g(p+2)$.

$g(p+2) =$ _____

14. Find a linear function h given $h(-1) = -8$ and $h(2) = -4$.

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

15. Solve: $x - 7\sqrt{x} + 12 = 0$

The solution is $x =$ _____.

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

$$f(x) = -2x^2 + 3x + 1$$

a) The vertex is (_____ , _____).

b) Choose the correct axis of symmetry.

A. $x = -\frac{3}{4}$ B. $x = \frac{3}{2}$ C. $x = -\frac{3}{2}$ D. $x = \frac{3}{4}$

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

❒ Maximum ❒ Minimum

d) Minimum/maximum value = _____.

17. Solve for x: $\frac{-2x}{x+8} = \frac{4}{x-12}$.

18. Sketch the graph of the polynomial function $f(x) = -(x-1)^2(2x+7)$. Label all intercepts.

19. Use synthetic division to find the quotient and the remainder. $\left(x^3 - 3x^2 - 4\right) \div (x+2)$

    The quotient is _____ and the remainder is _____.

20. Find a formula for the inverse $f(x) = \dfrac{x+4}{x-7}$.

    The inverse function is $f^{-1}(x) =$ _____.

21. Solve for x. Check all solutions.

    $$\log x + \log(x+3) = 1$$

22. Find all asymptotes, x–intercepts, and y–intercepts for the graph of the rational function.

    $$f(x) = \frac{2x-1}{x^2-4}$$

    a) The equation of the vertical asymptote(s) is/are $x =$ _____.
    b) The equation of the horizontal asymptote is $y =$ _____.
    c) The graph of $f(x)$ has one x–intercept at the point $(\_\_\_\_\_, 0)$.
    d) The graph of $f(x)$ has one y–intercept at the point $(0, \_\_\_\_\_)$.
    e) Sketch the graph $f(x)$. Label all intercepts and asymptotes.

Part III. There are 7 problems in this section. Choose any 4. Indicate in the boxes the problems you want graded. 8 points each.

❒ Grade 23. Find the equation for the circle whose diameter has endpoints $(-1,-5)$ and $(-3,1)$.

❒ Grade 24. Find the zeros (real and complex) of $f(x) = x^3 - 8$.

❒ Grade 25. Find a polynomial function of degree 4 with -2 as a zero of multiplicity 2 and $2i$ as a zero of multiplicity 1. Assume leading coefficient to be 1.

$f(x) = x^4 +$ _____

❒ Grade

26. Solve $2x^3 - x^2 \le 15x$. Express solution in interval form.

❒ Grade

27. Solve for x. $5^{x+6} = 4^{x-2}$

❒ Grade

28. The amount of carbon–14 present in animal bones after t years is given by $P(t) = P_0 e^{-0.00015t}$. A bone has lost 40% of its carbon–14. How old is the bone?

❒ Grade

29. Write an augmented matrix for the following system of equations. Solve the system using Gaussian or Gauss–Jordan elimination.

$$-2x + 6y = 0$$
$$3x - 2y = -4$$

NOTE: Do not choose this problem unless you can use the indicated method.