Algebra II Name_____
NO CALCULATORS ALLOWED

True/False
***On the review sheet**: Write "True" if the statement is TRUE; write "False" if the statement is FALSE.*

1. _____If $y = 2^x + 3$ and x = 4, then y = 11.

2. _____If a polynomial function has an odd degree, then it must have at least one x-intercept.

3. _____$3^{-1} = -3$.

4. _____ The equation $y = 3x^2 - 4x + 1$ has a discriminant value of $\sqrt{4} = 2$

5. _____ Given $f(x) = 2x$ and $g(x) = x + 5$, then $(f \circ g)(x) = (g \circ f)(x)$.

6. _____The leading coefficient of the polynomial function $y = x^2(2 - x)(5 - 2x)$ is 2.

7. _____The degree of the polynomial function $f(x) = -3x^4 - 7x^3 + x^2 - 5$ is 9.

8. _____The graph of the rational function $f(x) = \frac{4x}{x^2 - 2x}$ has a domain of $x \varepsilon (-\infty, 0) \cup (0,2) \cup (2, \infty)$.

9. _____ $x \in [0,5) \cup (5, \infty)$ is the domain of $f(x) = \frac{\sqrt{x}}{x - 5}$

10. _____The function $y = 2(0.99)^{x-2}$ is an example of exponential decay.

11. _____$\sqrt{-16} = 4i$

12. _____The graph of the function $y = x^3 + 4x^2 - 12x + 4$ has at most three extrema.

13. _____The right end behavior of a polynomial function with an odd degree and a negative leading coefficient is: As $x \to \infty$, $f(x) \to \infty$.

14. _____$\sqrt{100} = \pm 10$.

15. _____If $x^2 = 25$, then $x = \pm 5$.

16. _____ $x^3 - 27 = (x-3)(x^2 + 3x + 9)$

17. _____$\frac{3}{x} + x = \frac{x}{x-5}$ is a rational equation.

18. _____Given that $i = \sqrt{-1}$, then $i^3 = -1$.

19. _____ If $g(x) = f(x-3) + 4$, then the graph of $g(x)$ is $f(x)$ shifted 3 units to the left and 4 units up.

20. _____In the expression $\frac{x+1}{x} + \frac{5}{2x}$, x cannot equal –1 or 0.

21. _____ If $x_1 < x_2$ and $f(x_1) < f(x_2)$ then the function is decreasing on the interval (x_1, x_2)

Multiple Choice
On the review sheets: *Circle the letter corresponding to the correct response.*

1. If $f(x) = x^2 - x$ and $g(x) = x - 4$, then $(f \cdot g)(x)$ is

(A) $x^3 - 5x^2 - 4x$ (B) $x^3 - 5x^2 + 4x$ (C) $x^2 - 4x + 2$ (D) $x^2 - x + 4$

2. Which statement is true about the polynomial function $f(x) = x^4 - 81$?

(A) The function has zeros at x= -3 with multiplicity of 1
x = 3 with a multiplicity of 1
and two imaginary zeros.

(B) The function has zeros at x= -3 with multiplicity of 2
x = 3 with a multiplicity of 2.

(C) The function has zeros at x= -3 with multiplicity of 1
x = 3 with a multiplicity of 1
x = -9 with a multiplicity of 2.

(D) The function has zeros at x= -3 with multiplicity of 1
x = 3 with a multiplicity of 1
x = 9 with a multiplicity of 2.

3. What is the simplified form of $5e^{-8}\left(-2e^{3}\right)^{2}$

(A) $-10e^{-40}$ (B) $-20e^{2}$ (C) $\frac{20}{e^2}$ (D) $\frac{10}{e^2}$

4. If $f(x) = x^2 + 2x + 1$ and $g(x) = 3(x+1)^2$, which is an equivalent form of $f(x) + g(x)$?

(A) $x^2 + 4x + 2$ (B) $4x^2 + 2x + 4$ (C) $4x^2 + 8x + 4$ (D) $10x^2 + 20x + 10$

5. Sonya and Alex shared their work on the equation $|2x + 3|=13$, as shown below.

Sonya's Work

$$|2x+3|=13$$
$$-2x+3=13 \quad \text{or} \quad 2x+3=13$$
$$-2x=10 \quad \text{or} \quad 2x=10$$
$$x=-5 \quad \text{or} \quad x=5$$

Alex's Work

$$|2x+3|=13$$
$$2x+3=13 \quad \text{or} \quad 2x+3=-13$$
$$2x=10 \quad \text{or} \quad 2x=-16$$
$$x=5 \quad \text{or} \quad x=-8$$

Which statement is true?

(A) Sonya solved the equation correctly.

(B) Alex solved the equation correctly.

(C) The only solution for the original equation is 5.

(D) Neither Alex not Sonya solved the equation correctly.

6. If you use $y = x^2$ as a reference graph, describe how you would graph $y=(x-5)^2+2$.

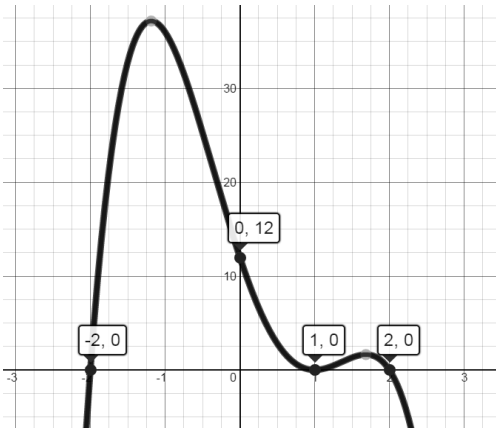
(A) Move 5 units down, then 2 units to the right.

(B) Move 5 units to the left then 2 units up.

(C) Move 5 units to the left, then 2 units down.

(D) Move 5 units to the right then 2 units up.

7. Which equation best represents the graph shown below?



(A) $f(x)=-\frac{3}{2}(x+2)^2(x-1)^2(x-2)^2$

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

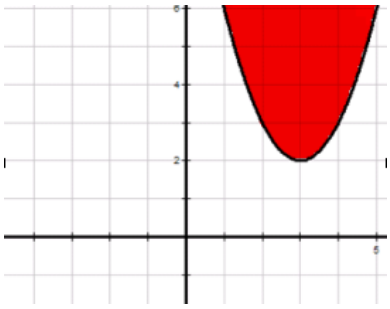
(C) $f(x)=-3(x+2)(1-x)(x-2)$

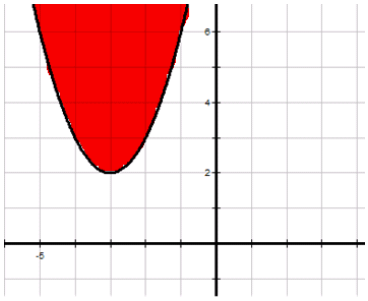
(D) $f(x)=\frac{3}{2}(x+2)(1-x)(x-2)^2$

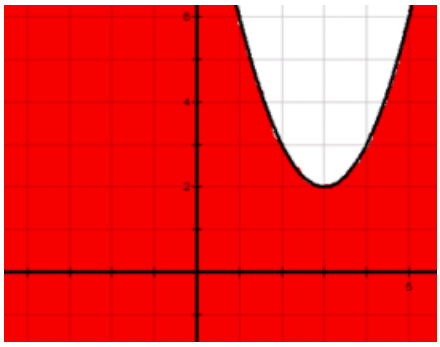
8. $(1-4i)(5+2i)=$

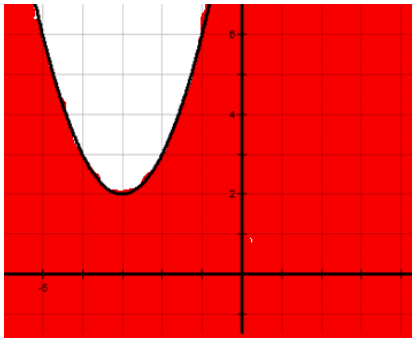
(A) -3 (B) 13 (C) $13-18i$ (D) $-3-18i$

9. Which is the graph of $y \le (x+3)^2+2$?

(A) 

(B) 

(C) 

(D) 

10. $(x^3-9x^2-2x+5)+(4x^3-8x-7)-(2x^2+3)=$

(A) $5x^3-11x^2-10x+1$ (B) $5x^3-11x^2-10x-5$

(C) $5x^3-7x^2+6x+1$ (D) $5x^6-11x^4-10x^2-5$

11. Which ordered pair is a solution to this system of equations?

$$y = x^2 - 6x + 11$$
$$y = -3x + 9$$

(A) (6,1) (B) (4,0) (C) (2,3) (D) (1,0)

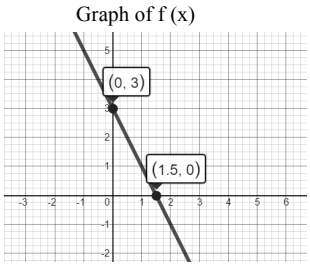
12. $\dfrac{21x^3 - 9x^2 + 10}{3x^2} =$

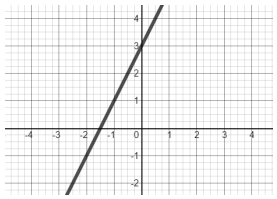
(A) $18x - 6 + \dfrac{7}{x^2}$ (B) $7x - 3 + \dfrac{10}{3}x^2$ (C) $7x - 3 + \dfrac{10}{3x^2}$ (D) $4 + \dfrac{10}{3x^2}$

13. $8^{-5/3} =$

(A) $-\dfrac{40}{3}$ (B) $\dfrac{3}{16}$ (C) $-\dfrac{1}{32}$ (D) $\dfrac{1}{32}$

14. Given the graph of $f(x)$, which of the following is the graph of $y = \dfrac{1}{f(x)}$?



(A)


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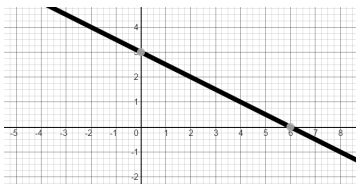

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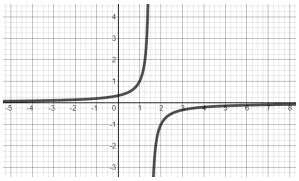
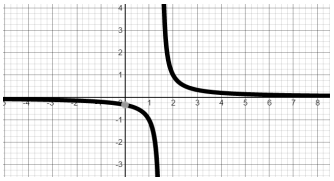


(D)


15. $\frac{8a^4b^6c}{5ac^3} \cdot \frac{10a^3bc^5}{6b^4c^7} =$

(A) $\frac{24a^4b^9}{25}$ (B) $\frac{24a^{13}b^{23}}{25c^8}$ (C) $\frac{8a^8b^2}{3c^{16}}$ (D) $\frac{8a^6b^3}{3c^4}$

16. Which of the following is NOT a solution to the equation $x^3 + 9x^2 - 9x - 81 = 0$?

(A) -9 (B) -3 (C) 0 (D) 3

17. In the expression $\frac{x+4}{2x} + \frac{x-7}{2x+10}$, which values would be restrictions on the variable?

(A) -4, 7 (B) 0, -5 (C) -4, 7, 0, -5 (D) 2, -5

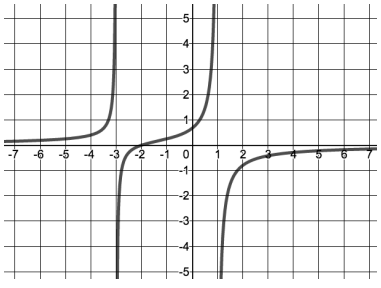
18. What would have to be the value of k so that $x^2 - bx + k$ is a perfect trinomial square?

(A) b (B) $\frac{b}{2}$ (C) b^2 (D) $\frac{b^2}{4}$

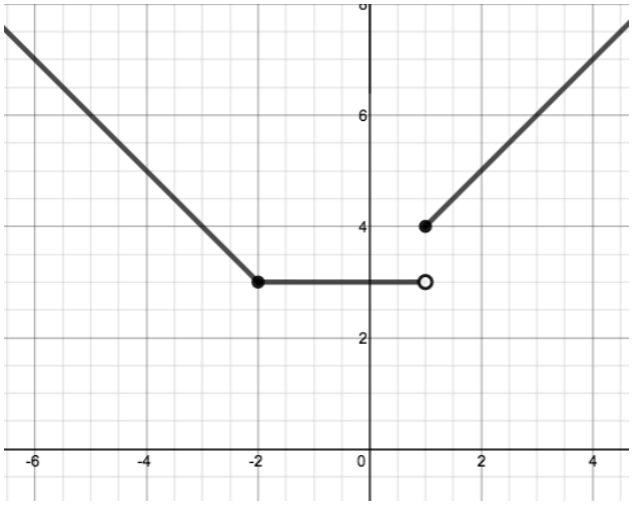
19. Which of the following is the equation represented by the graph shown?

(A) $y = \frac{(x-2)}{(x+1)(x-3)}$ (B) $y = \frac{(x+2)}{(x-1)(x+3)}$

(C) $\frac{4}{x} + \frac{3}{2x} \geq \frac{5}{x^2}$ (D) $y = \frac{(x-3)(x+1)}{(x-2)}$



20. Determine which function represents the graph below.



(A) $f(x)=\begin{cases} -x+1, & x<-2 \\ 3, & -2<x<1 \\ x+3, & x>1 \end{cases}$

(B) $f(x)=\begin{cases} -x+1, & x<-2 \\ 3, & -2 \le x<1 \\ x+3, & x\ge 1 \end{cases}$

(C) $f(x)=\begin{cases} -x+1, & x\le -2 \\ 3, & -2<x\le 1 \\ x+3, & x>1 \end{cases}$

(D) $f(x)=\begin{cases} x+1, & x\le -2 \\ 3, & -2<x<1 \\ x+3, & x\ge 1 \end{cases}$

Fill-Ins
On the review sheets: *Write the correct response to each question.*

1. $\dfrac{6-i}{3+2i}$ simplifies to _____

2. A triangle has a base length of $(3x-4)$ and a height of $(4x-5)$. The area of the triangle, in terms of x and in simplified form, is _____

3. The graph of $g(x)=3x^9-7x^6-x^3+21x+12$ has at most _____ turns.

4. The function $g(x)=3x^9-7x^6-x^3+21x+12$ has EXACTLY _____ zeros.

5. Rounded to the nearest thousandth, the value of the number e is_____.

6. The graph of $f(x)=2x^2-3x+7$ opens _____.

7. The range of the relation { (-9, 7), (-1, 0), (1, 5), (-5, -3)} is _____.

8. The maximum number of positive real roots to $-x^3+4x^2-12x-5=0$ is_____.

9. When the function $y=(x^3+1)(3x-2)(23x-1)$ is written in standard form, the constant term is_____.

10. The inverse of the function y = 2x + 7 is _____.

11. $(9a^7b^3)(-4ab^{-5})$ = _____ (write your answer with positive exponents).

12. If a polynomial function has zeroes -2, 0, and 5, then its factors are _____.

13. Determine the *x*-intercept(s) of $f(x)=3x^3+2x^2-12x-8$. _____

14. Determine the *x*-intercept(s) of $y=\dfrac{(x+5)(7-x)(x+2)}{(x+2)(x-2)}$. _____

15. $32^{2/5}$ = _____.

16. The zeroes of the function $f(x)=\dfrac{x^2+x+2}{x-3}$ is/are_____.

Equations and Inequalities

On the answer sheets: *Write the solution to each equation or inequality. Show your work.*

1. $9^{2x-1} = 27^{x+4}$

2. $\sqrt{2x-1}+4=10$

3. $4x^2+12=0$

4. $x(4x+9)^4(x-2)=0$

5. $6x^2+x=15$

6. $x^2+2x+6=0$

7. $x^2(x-1)-4(x-1)=0$

8. $x^3+4x^2-2x-8=0$

9. $\frac{25}{x}=\frac{2x}{8}+\frac{15}{4}$

10. $\frac{5}{x-2}+\frac{2}{x}=\frac{1}{x(x-2)}$

11. Solve the inequality $\frac{4}{x}+\frac{3}{2x}\geq\frac{5}{x^2}$.

Graphing

On the review sheets: *Sketch the graph of each corresponding equation.* **You must include all intercepts and asymptotes (if applicable) on your graphs and include labels.**

12. $y=\frac{x^2-4}{3x^2-4x-4}$

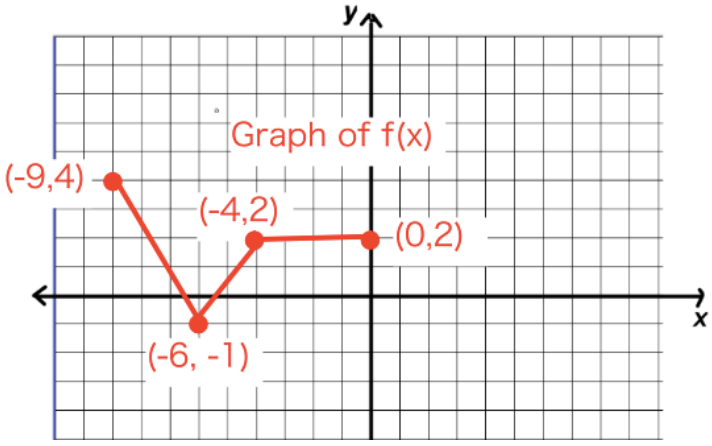
13. $f(x)=2x^2+x-3$

14. $f(x)=-x^4-x^3+4x^2+4x$

15. $f(x)=-4(x+3)(x+1)(x-1)^2$

16. $f(x)=\begin{cases}-x^2+3, & x<1\\ x+3, & x\geq 1\end{cases}$

17. Use the graph of $f(x)$ to graph $g(x) = f(2-x)+3$



Short Answer Questions

On the review sheets: *Write your final answers. Leave all answers as exact answers, in most simplified form, unless otherwise stated. Do not forget to include the appropriate units of measurement. Show all of your work in the space provided next to each question below.*

18. a. Simplify $\dfrac{6x}{x^2-4} - \dfrac{x-3}{x+2}$

b. Simplify $\left(\dfrac{x^2-4}{x-2}\right)\left(\dfrac{x-3}{x^2-4x-12}\right)$

19. Determine all the zeros of $f(x) = x^4 - 5x^3 + 8x - 40$.

20. The height of a baseball hit into the air is modeled by the equation $h = -5t^2 + 30t + 1$, where h represents the height of the ball in meters and t represents the time after the ball is hit in seconds.

a. How high is the ball after two seconds?

b. In how many seconds will the ball reach its maximum height?

c. What is the maximum height of the ball?

d. In how many seconds will the ball hit the ground?

21. Consider the rational function $f(x) = \frac{x-4}{x^2-16}$.

a. Simplify the function f(x).

b. State the domain of f(x).

c. Find all vertical asymptotes for $f(x)$.

d. Find the horizontal asymptote for $f(x)$.

e. Find all removable discontinuities for $f(x)$.

22. Let $f(x)=\frac{1}{4}x-3$ and $g(x)=2x^2-7$.

a. Evaluate $g(-5)$.

b. Evaluate $f(28)$.

c. Evaluate $g(m-3)$.

d. Write a function for h(x) given that $h(x)=3f(x)+2g(x)$

e. Write a function for $s(x)=(fg)(x)$

23. Given that $m(x)=\begin{cases} x^3-2x+4, & x<2 \\ \dfrac{5}{x+5}, & x\geq 2 \end{cases}$,

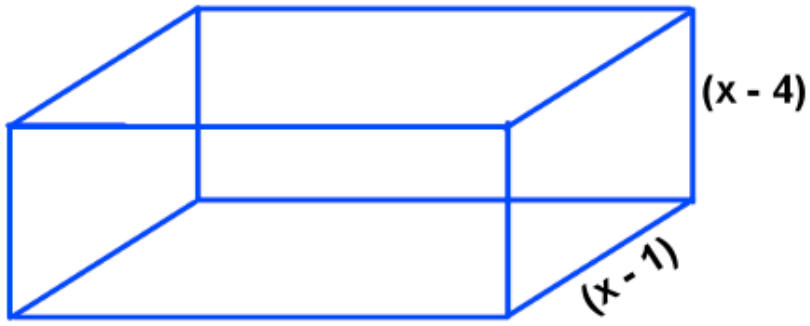
a. Find $m(-3)$.

b. Find $m(2)$.

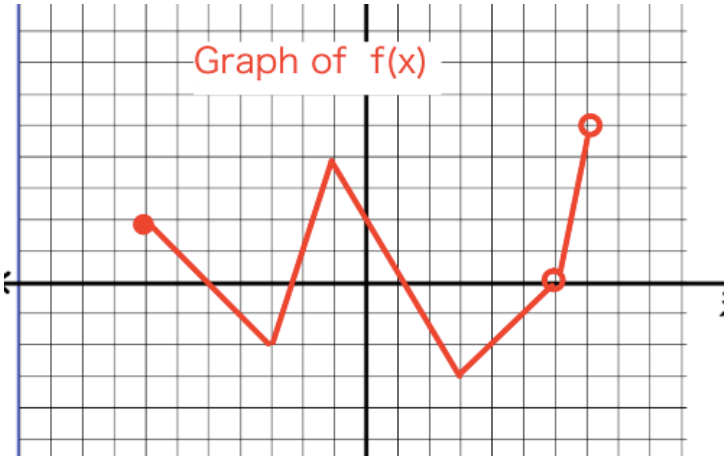
c. Find $m(8)$.

d. State the domain of $m(x)$.

. 24. The volume of the box is $V=3x^3-17x^2+22x-8$. If the depth is $x-1$ and the height is $x-4$ what is the width?



Use the graph below to answer #25 – 36.



25. Domain:_____

26. Range:_____

27. Zeros: _____

28. $f(-2)$ _____

29. Relative maximum: _____

30. Absolute maximum:_____

31. Relative minimum: _____

32. Absolute minimum:_____

33. Intervals of increase: _____

34. Intervals of decrease: _____

35. The value(s) of x, such that $f(x) = 4$

36. The value(s) of x, such that $f(x) < 0$.