## Algebra 2: $\mathbf{1}^{\text {st }}$ Semester Final Review: Fall 2023

Multiple Choice: Identify the choice that best completes the statement or answers the question.

1. Which of the following is a proper description of the domain \& range of the function shown:

A. $D:\{x \mid-4<x \leq-1\}$
C. $D:\{x \mid-7 \leq x \leq 2\}$
R: $\{y \mid-7<y \leq 2\}$
$R:\{y \mid-4<y \leq-1\}$
B. $D:[-4,-1)$
D. $D:[-7,2)$
$R:[-7,2)$
R: $[-4,-1)$
2. Nicole wants to get a pedicure and manicure for the homecoming dance. She sees the following prices advertised at a salon.

| Haircut and Manicure | $\$ 48.00$ |
| :---: | :--- |
| Haircut and Pedicure | $\$ 53.00$ |
| Haircut, Manicure, and Pedicure | $\$ 78.00$ |

Assume the price of each option is the same as purchasing each item separately. How much will Nicole spend on a manicure and pedicure?
A. $\$ 52.50$
B. $\$ 55.00$
C. $\$ 54.00$
D. $\$ 57.00$
3. Describe the domain and range of the function graphed below.
A. Domain: $[-5,7)$

Range: $(-7,7]$
B. Domain: $(-5,7]$

Range: $[-3,1]$
C. Domain: $(3,7]$

Range: [7, -5]
D. Domain: $(-7,7]$

Range: $[-5,7]$


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4. Given the graph below, which interval has the largest average rate of change?
A. $[-10,4]$
B. $[-4,2]$
C. $[-8,0]$
D. $[-6,0]$

5. Which equation is obtained after the translation of the graph up 5 units and left 4 units?
A. $\quad f(x)=|x-3|$
B. $\quad f(x)=|x|-3$
C. $\quad f(x)=|x+3|$
D. $\quad f(x)=|x|+3$

find abs under
6. Which of the following piecewise functions represents the graph below?
A. $f(x)=\left\{\begin{array}{lr}\frac{3}{2} x+1, & x<-2 \\ 2 x+3, & -2 \leq x<1 \\ -x+2, & x \geq 1\end{array}\right.$
B. $f(x)=\left\{\begin{array}{lr}-\frac{3}{2} x+1, & x<-2 \\ 2 x+3, & -2 \leq x<1 \\ x+2, & x \geq 1\end{array}\right.$
C. $f(x)=\left\{\begin{array}{lr}-\frac{3}{2} x+1, & x \leq-2 \\ 2 x+3, & -2<x \leq 1 \\ x+2, & x>1\end{array}\right.$
D. $\quad f(x)=\left\{\begin{array}{lr}\frac{3}{2} x+1, & x \leq-2 \\ 2 x+3, & -2<x \leq 1 \\ -x+2, & x>1\end{array}\right.$


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7. Which of the following functions has the same end behavior as the function below?

A. $g(x)=-6 x-7$
B. $g(x)=|x+3|-5$
C. $g(x)=-x^{2}-4 x+5$
D. $g(x)=x^{3}+2 x$
8. What are the solutions to the quadratic equation, $3 x^{2}+21 x=5 x-60$ ?
A. $x=\frac{-8 \pm 4 i \sqrt{29}}{3}$
B. $x=\frac{-8 \pm 2 i \sqrt{29}}{3}$
C. $x=\frac{-8 \pm 2 i \sqrt{61}}{3}$
D. $x=\frac{-8 \pm i \sqrt{61}}{2}$
9. Which of following functions does NOT represent the parabola with a vertex at $(-4,4)$ and $x$-intercepts $(-2,0)$ and $(-6,0)$.
A. $f(x)=-x^{2}-8 x-12$
B. $f(x)=-(x+4)^{2}+4$
C. $f(x)=-x^{2}+8 x+20$
D. $f(x)=-(x+2)(x+6)$
10. What are the solutions to the quadratic equation, $x^{2}-2 x=4 x-8$ ?
A. $x=4,2$
B. $x=-4,-2$
C. $x=4,-2$
D. $x=-4,-2$

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11. Simplify: $5 \sqrt{-300}$
A. $-15 \sqrt{10}$
B. $5 i \sqrt{3}$
C. $10 i \sqrt{3}$
D. $50 i \sqrt{3}$
12. Simplify: $(16+i)-(5-10 i)$
A. $11+11 i$
B. $11-9 i$
C. $19+11 i$
D. $11-10 i$
13. Simplify: $4 i(10+i)-6(2-3 i)$
A. $28+22 i$
B. $-16+58 i$
C. $-8+58 i$
D. $8+22 i$
14. Simplify: $(5-3 i)^{2}$
A. $16-30 i$
C. $34-30 i$
B 16
D. $30-15 i+9 i^{2}$
15. Simplify: $(8-2 i)(4+3 i)$
A. $12+i$
B. $32+16 i-6 i^{2}$
C. $32+10 i$
D. $38+16 i$
16. Simplify: $\frac{5+3 i}{4+i}$
A. $\frac{23+7 i}{17}$
B. $\frac{5 i-3}{4 i-1}$
C. $\frac{20+4 i}{16}$
D. $\frac{20+4 i}{17}$

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17. Given the function, $f(x)=(x+4)^{2}-2$, state whether the parabola opens up or down and the maximum or minimum value.
A. Opens down, Maximum value is -2
B. Opens down, Maximum value is 4
C. Opens up, Minimum value is 4
D. Opens up, Minimum value is -2
18. Given the function, $f(x)=-x^{2}+4 x+6$, state whether the parabola opens up or down and the maximum or minimum value.
A. Opens up, Minimum value is 6
B. Opens down, Maximum value is 6
C. Opens down, Maximum value is 10
D. Opens down, Maximum value is 2
19. Which function is represented by the graph?
A. $f(x)=\frac{1}{2}(x-3)(x-5)$
B. $f(x)=(x+3)(x+5)$
C. $f(x)=(x-3)(x-5)$
D. $f(x)=2(x-3)(x-5)$

20. Which equation is represented by the graph?
A. $y=(x+3)^{2}-7$
B. $y=2(x-3)^{2}-7$
C. $y=2(x+3)^{2}-7$
D. $y=-(x+3)^{2}-7$


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21. Which description explains how the graph of $f(x)=x^{2}-2 x-3$ is related to the graph of $g(x)=x^{2}-2 x-6$ shown here?
A. $f(x)$ is vertically stretched to make $g(x)$
B. $f(x)$ is translated down 3 units to make $g(x)$
C. $f(x)$ is translated 3 units left to make $g(x)$
D. $f(x)$ is translated up 3 units to make $g(x)$

22. Translate $y=x^{2}+6 x+10$ three (3) units up. What is the graph obtained after the translation?
A.

C.

B.

D.

23. What is the end behavior for the function, $f(x)=\left(x^{4}-5 x-3\right)\left(-9 x^{5}+6 x^{3}\right)$ ?
A. as $x \rightarrow-\infty, f(x) \rightarrow+\infty$ and as $x \rightarrow+\infty, f(x) \rightarrow-\infty$
B. as $x \rightarrow-\infty, f(x) \rightarrow+\infty$ and as $x \rightarrow+\infty, f(x) \rightarrow+\infty$
C. as $x \rightarrow-\infty, f(x) \rightarrow-\infty$ and as $x \rightarrow+\infty, f(x) \rightarrow-\infty$
D. as $x \rightarrow-\infty, f(x) \rightarrow-\infty$ and as $x \rightarrow+\infty, f(x) \rightarrow+\infty$

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24. State where the function is increasing and decreasing.
A. Never Increasing

Decreasing: $(-\infty,+\infty)$
B. Increasing: $(1.5,4) \cap(4,+\infty)$

Decreasing: $(-\infty,-4)$
C. Increasing: $(-\infty,-1) \cup(1.5,4)$

Decreasing: $(-1,1.5) \cup(4, \infty)$
D. Increasing: $(-1,1.5) \cup(4, \infty)$

Decreasing: $(-\infty,-1) \cup(1.5,4)$

25. Which of the following is true of the function graphed?
A. relative maxima: 0
B. relative minima: $-4,-0.5,0.5$
C. relative maxima: -2.5
D. relative minima: -3

26. Factor: $x^{4}-17 x^{2}+16$
A. $\left(x^{2}+16\right)\left(x^{2}+1\right)$
B. $\left(x^{2}+1\right)(x-4)(x+4)$
C. $(x-1)(x+1)(x+4)^{2}$
D. $(x-1)(x+1)(x+4)(x-4)$
27. Factor: $125 x^{3}-343$
A. $(5 x-7)\left(5 x^{2}+35 x+9\right)$
B. $(5 x-7)\left(5 x^{2}+35 x-9\right)$
C. $(5 x-7)\left(25 x^{2}+35 x+49\right)$
D. $(5 x-7)\left(25 x^{2}-35 x-49\right)$
28. Solve: $3 m^{3}+7 m^{2}-6 m=0$
A. $m=3,-\frac{2}{3}$
B. $m=0,-3, \frac{2}{3}$
C. $m=0,3, \frac{3}{2}$
D. $m=-3, \frac{2}{3}$

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29. Solve: $x^{5}-16 x=0$
A. $x=0, x= \pm 2, x= \pm 2 i$
B. $x=0, x= \pm 2$
C. $x=0, x= \pm 4$
D. $x=0, x= \pm 2 i$
30. Solve: $x^{4}-64=0$
A. $x= \pm \sqrt{8}, x= \pm 8 i$
B. $x= \pm 2 \sqrt{2}, x= \pm 2 i \sqrt{2}$
C. $x= \pm 8, x= \pm 8 i$
D. $x= \pm 4, x= \pm 4 i$
31. What are the x -coordinates of the solution for the system given below?

$$
\left\{\begin{array}{c}
x^{2}+4 x+10 y-18=17 \\
2 x+5 y=-7
\end{array}\right.
$$

A. $x=7$
B. $x=7$ and $x=-7$
C. $x=49$
D. $x=-49$ and $x=-49$
32. Solve the following system to find the $\mathbf{y}$-coordinates of the solution:

$$
\left\{\begin{array}{l}
y=x^{2}+10 x+5 \\
y=3 x-7
\end{array}\right.
$$

A. $y=2$ and $y=5$
B. $y=3$ and $y=4$
C. $y=-3$ and $y=-4$
D. $y=-16$ and $y=-19$

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33. The function $f(x)=-\frac{1}{2} x^{3}+\frac{5}{4} x^{2}+3 x$ is graphed at the right. Over which intervals of $x$ is the graph above the $x$-axis?
A. $(-\infty,+\infty)$
B. $(-\infty,-1.5) \cup(0,4)$
C. $(-\infty, 1.5) \cup(0,2.5)$
D. $(-1.5,0) \cup(4,+\infty)$

34. Which of the following functions is equivalent to $f(x)=\frac{1}{2} x^{2}+8 x+11$ ?
A. $g(x)=\frac{1}{2}(x+8)^{2}-7$
B. $g(x)=\frac{1}{2}(x+8)^{2}-21$
C. $g(x)=\frac{1}{2}(x+8)^{2}+11$
D. $g(x)=\frac{1}{2}(x+8)^{2}+22$
35. Given $f(x)=5 x^{2}+18 x+3$ and $g(x)=-2 x+3$, complete the tables below to find the x -values where $f(x)=g(x)$.

| $f(x)=5 x^{2}+18 x+3$ |  |
| :---: | :---: |
| $x$ | $f(x)$ |
| -5 | 38 |
| -4 | 11 |
| -3 | -6 |
| -2 | -13 |
| -1 | -10 |
| 0 | 3 |
| 1 | 26 |
| 2 | 59 |
| 3 | 102 |
| 4 | 155 |
| 5 | 218 |


| $g(x)=-2 x+3$ |  |
| :---: | :---: |
| $x$ | $g(x)$ |
| -5 |  |
| -4 |  |
| -3 |  |
| -2 |  |
| -1 |  |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

A. $x=0,2,5$
C. $x=0, x=-4$
B. $x=0,3$
D. no solution

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36. If $(x+3)(x-7)=(x-h)^{2}+k$, then what is the value of $k$ ?
A. $k=-25$
B. $k=-17$
C. $k=18$
D. $k=4$
37. Which of the following functions does not have zeros of -3 and 9 ?
A. $y=(x-3)^{2}-36$
B. $y=(x-3)(x+9)$
C. $y=x^{2}-6 x-27$
D. $y=2 x^{2}-12 x-54$
38. Given the function, $f(x)=-(x-3)^{2}+4$, determine which of the following statements is true.
A. The maximum value of $f(x)$ is -3 and $f(x)=0$ has no real solutions.
B. The maximum value of $f(x)$ is -3 and $f(x)=0$ has two real solutions.
C. The maximum value of $f(x)$ is 4 and $f(x)=0$ has no real solutions.
D. The maximum value of $f(x)$ is 4 and $f(x)=0$ has two real solutions.
39. Compare the axis of symmetry and the minimum values for the two functions below.

$$
\begin{aligned}
h(x) & =2(x+3)(x-5) \\
j(x) & =x^{2}-2 x-15
\end{aligned}
$$

Determine which of the following statements is correct.
A. The functions $h(x)$ and $j(x)$ have the same x -intercepts, but the minimum value of $h(x)$ is less than the minimum value of $j(x)$.
B. The functions $h(x)$ and $j(x)$ have the same $x$-intercepts, but the minimum value of $h(x)$ is greater than the minimum value of $j(x)$.
C. The functions $h(x)$ and $j(x)$ do not have the same x -intercepts, and the minimum value of $h(x)$ is less than the minimum value of $j(x)$.
D. The functions $h(x)$ and $j(x)$ do not have the same $x$-intercepts, and the minimum value of $h(x)$ is greater than the minimum value of $j(x)$.

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40. A parabola has a vertex of $(2,-13)$ and passes through the point $(7,-3)$. In the $y=a(x-h)^{2}+k$ form of the parabola, what is the value of $a$ ?
A. -2
B. $\frac{2}{5}$
C. $-\frac{2}{5}$
D. $-\frac{2}{45}$
41. Which of the following systems of equations could a student use to write a quadratic function in standard form for the parabola passing through the points $(2,-4),(-4,3)$, and $(4,8)$ ?
A. $\left\{\begin{array}{c}2 x^{2}-4 x+c=y \\ -4 x^{2}+3 x+c=y \\ 4 x^{2}+8 x+c=y\end{array}\right.$
B. $\left\{\begin{array}{l}4 a+2 b+c=-4 \\ 16 a-4 b+c=3 \\ 16 a+4 b+c=8\end{array}\right.$
C. $\left\{\begin{array}{c}a-3 b+c=y \\ 16 a+6 b+c=y \\ 25 a+9 b+c=y\end{array}\right.$
D. $\left\{\begin{array}{c}4 a+2 b+c=-4 \\ -8 a-4 b+c=3 \\ 8 a+4 b+c=8\end{array}\right.$
42. A parabola has $x$-intercepts at 3 and -4 and goes through the point $(2,9)$. What other point is on the parabola?
A. $(-2,-2)$
B. $(4,-2)$
C. $(-3,15)$
D. $(1,15)$
43. Solve the following equation: $\frac{1}{3}(x+5)^{2}=9$
A. $x= \pm \sqrt{8}$
B. $x=-2,-8$
C. $x=-5 \pm \frac{3 \sqrt{3}}{9}$
D. $x=-5 \pm 3 \sqrt{3}$

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44. Compare the two functions represented below. Determine which of the following statements is true.

A. The functions have the same vertex.
B. The minimum value of $f(x)$ is the same as the minimum value of $g(x)$.
C. The functions have the same axis of symmetry.
D. The minimum value of $f(x)$ is less than the minimum value of $g(x)$.
45. Which of the following statements describe key features of $(x)=x^{2}+2 x+7$ ? Select all that apply.
F. The $y$-intercept is $(0,7)$.
G. The $y$-intercept is $(0,2)$.
H. The vertex is $(-1,6)$.
I. The vertex is $(2,7)$.
J. The minimum is $y=6$.
K. The minimum is $y=7$.
L. The axis of symmetry is $x=-1$.
M. The axis of symmetry is $x=2$.
