SOLUTIONS

BRONX COMMUNITY COLLEGE
of the City University of New York

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MTH 30 Exam 2
Kerry Ojakian SPRING 2026
YOUR NAME (first, then last):

Directions: Write your responses in the provided space. To get full credit you **must** show all your work. Simplify your answers whenever possible. Be certain to indicate your final answer clearly. **No** electronic devices are allowed (i.e. no calculators, no phones, no smart watches, etc) - using one during the exam will result in at least a failure on this test. Each question is worth 10 points (total scaled to 100).

1. Solve.

   (a) $|3x - 2| = 14$ (b) $|42x + 7| = -3$

   SOLUTION:
   For (a) we solve the following 2 equations

$$\begin{aligned} 3x - 2 &= 14 \\ 3x &= 16 \\ x &= \frac{16}{3} \end{aligned}$$

$$\begin{aligned} 3x - 2 &= -14 \\ 3x &= -12 \\ x &= -4 \end{aligned}$$

   So for (a), the answer is $x = \frac{16}{3}, \quad -4$.

   For (b): It has No Solution. Since absolute value cannot equal negative.

2. Solve.

(a) $|3x-5| \leq 13$

(b) $|x+10| \geq 2$

SOLUTION:
For (a)

$$\begin{array}{ccccc} -13 & \leq & 3x-5 & \leq & 13 \\ -8 & \leq & 3x & \leq & 18 \\ \frac{-8}{3} & \leq & x & \leq & 6 \end{array}$$

For (b)
Get two inequalities: Either $x+10 \leq -2$ or $x+10 \geq 2$. Solve each to get answer: $x \leq -12$ or $x \geq -8$.

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3. Let $f(x) = \dfrac{x^2-25}{-2(x+3)(4x-12)}$

(a) When is the function undefined?

(b) What is the domain of the function?

(c) Evaluate $f(0)$.

(d) Which x values make $f(x)=0$?

SOLUTION:
a) Undefined when $-2(x+3)(4x-12)=0$ so for either $(x+3)=0$ or $(4x-12)=0$, so for $x=-3,3$
b) All reals except -3 and 3.
c) $f(0) = \dfrac{(0)^2-25}{-2((0)+3)(4(0)-12)} = \dfrac{-25}{-2(3)(-12)} = -\dfrac{25}{72}$
d) The output is zero when $x^2-25=0$. To solve, add 25 to both sides to get: $x^2=25$, whose solutions are $x=-5,5$.

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4. For each pair of functions, check if they are inverses by checking if both $f(g(x)) = x$ and $g(f(x)) = x$.

   (a) $f(x) = x + 1,\ g(x) = -x - 1$

   (b) $f(x) = \dfrac{x}{4} - 1,\ g(x) = 4(x + 1)$

   SOLUTION:
   For (a).

$$\begin{aligned} f(g(x)) &= (-x-1)+1 \\ &= -x \\ &\neq x \end{aligned}$$

   Therefore they are **not** inverses (could also see this by trying $g(f(x))$ instead).

   For (b).

$$\begin{aligned} f(g(x)) &= \frac{4(x+1)}{4} - 1 \\ &= x + 1 - 1 \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= 4\left((\frac{x}{4} - 1) + 1\right) \\ &= 4\left(\frac{x}{4}\right) \\ &= x \end{aligned}$$

   Therefore they **are** inverses.

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5. Find the inverse of the function $g(x) = \dfrac{4-2x}{8}$

   SOLUTION:
   Swap x and y to get: $x = \dfrac{4-2y}{8}$. Then solve for y:

$$\begin{aligned} 8x &= 4 - 2y \\ 8x - 4 &= -2y \\ -4x + 2 &= y \end{aligned}$$

   Thus $g^{-1}(x) = -4x + 2$

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6. Consider the linear function $f(x) = -3x + 2$. Find its slope and all its intercepts. Then graph f.

SOLUTION:
It is in $mx + b$ form with $m = -3$ and $b = 2$, so:
Slope is -3
y-intercept is 2.
For x-intercepts: Solve $-3x + 2 = 0$. Subtract 2 to get $-3x = -2$, then divide by -3 to get $x = \frac{2}{3}$.
Graph:

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7. Find the point of intersection between the lines, if it exists:
$h(x) = 7x + 2$ and $g(x) = 4x - 10$.

SOLUTION:

$$\begin{aligned} 7x + 2 &= 4x - 10 \\ 3x &= -12 \\ x &= -4 \end{aligned}$$

To find y, use either equation, say: $y = 7(-4) + 2 = -26$, thus the point of intersection is $(-4, -26)$.

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8. Consider the linear equation $f(x) = 3x - 1$.

   (a) Write the equation for a line parallel to $f(x)$ and passing through the point $(-2, 7)$.

   (b) Write the equation for a line perpendicular to $f(x)$ and passing through the point $(0, -5)$.

SOLUTION:

(a) To be parallel, the slope is 3. Using the point $(-2, 7)$ and the point-slope form of the line we get: $y = 7 + 3(x - (-2))$ which simplifies to $y = 7 + 3(x + 2)$ or even $y = 3x + 13$

(b) To be perpendicular, the slope is $-\frac{1}{3}$. Using the point $(0, -5)$ and the point-slope form of the line we get: $y = -5 + -\frac{1}{3}(x - 0)$ which simplifies to $y = -\frac{1}{3}x - 5$

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9. What is the domain and range of the quadratic function $g(x) = x^2 + 6x + 4$.

SOLUTION:
Domain: All reals.

Range: First find the x coordinate of the vertex, from the axis of symmetry (from $x = \dfrac{-b}{2a}$), that is: $x = \dfrac{-6}{2(1)}$, so $x = -3$.
To find the y coordinate of the vertex: $g(-3) = 9 - 18 + 4 = -5$, so the vertex is $(-3, -5)$.
Since this parabola opens up, the range is: All reals $y \geq -5$.

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10. The amount of money in dollars (M) in the school's bank account t days after it opens is modeled by $M(t) = 2t^2 - 20t + 85$.

    (a) How many days after the school opens is the bank account's minimum reached?

    (b) What is that minimum amount of money in the bank account?

SOLUTION:
This parabola opens up, so has a minimum at its vertex.

For (a): Find the axis of symmetry ($t = \dfrac{-b}{2a}$), so $t = \dfrac{-(-20)}{2(2)}$, so $t = 5$. So the minimum occurs when $t = 5$, so after 5 days.

For (b): Find the y coordinate of the vertex, by $M(5) = 50 - 100 + 85 = 35$, so the minimum amount of money is \$35.
