

# Math 02: Quiz 2

15 March 2024

Name: Answer Key

This is the second quiz. There are 10 questions. Each is worth 10 points, for a total of 100.

At the end of the quiz are 2 make-up questions for quiz 1. You do not have to do them if you are happy with your quiz 1 grade. If you do the make-up questions, I'll grade them and use them to replace your lowest-scored questions from quiz 1.

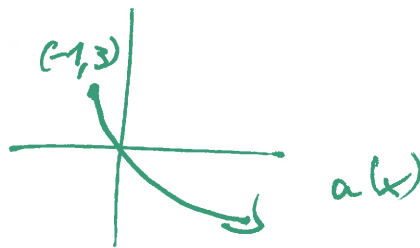
Carefully read each question and understand what is being asked before you start to solve the problem. Please show your work in an orderly fashion, and circle or mark in some way your final answers.

No calculators nor other electronic devices are allowed.

1		6	
2		7	
3		8	
4		9	
5		10	

1. Sketch a graph of  $a(x) = -3\sqrt{x+1} + 3$ . What are the domain and range of  $a(x)$ ?

vert. Flip  
vert. stretch by 3  
 $\leftarrow 1$   
 $\uparrow 3$

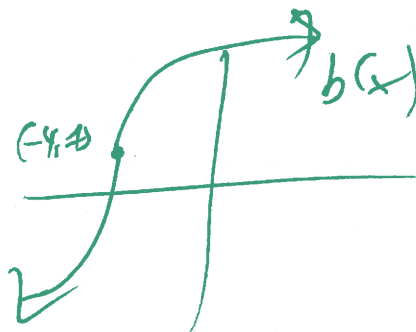


dom:  $x \geq -1$

ran:  $y \leq 3$

2. Sketch a graph of  $b(x) = \sqrt[3]{4+x} + 1$ . What are the domain and range of  $b(x)$ ?

$\leftarrow 4$   
 $\uparrow 1$



dom: all real #'s

ran: all real #'s

3. Find all solutions to the following simultaneous pair of equations.  
Give both  $x$  and  $y$  for the solutions.

$$y = x^2 + 5x - 1$$

$$y = 2x^2 + x + 3$$

$$x^2 + 5x - 1 = 2x^2 + x + 3$$

$$0 = x^2 - 4x + 4$$

$$0 = (x - 2)^2$$

$$\underline{x = 2}$$

$$\text{@ } x=2 \quad y = 2^2 + 5 \cdot 2 - 1 \\ = 13$$

$$\underline{(2, 13)}$$

4. Do these two graphs intersect? Justify your answer with a calculation.

$$y = x^2 - 2x$$

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

$$x^2 - 2x = -x^2 + 3x - 4$$

$$2x^2 - 5x + 4$$

$$b^2 - 4ac = 25 - 4 \cdot 2 \cdot 4$$

$$= 25 - 32$$

$$= -7$$

discriminant  $< 0$ ,

so 0 solutions.

The graphs do not intersect

5. Fully simplify the following expression. Your final answer should have no negative exponents.

$$\frac{(3x)^3 y^{-2}}{3^5 x y^5 z^{-1}}$$

$$= \frac{3^3 x^3 z}{3^5 x y^5 y^2} = \frac{x^2 z}{3^2 y^7} = \frac{x^2 z}{9 y^7}$$

6. Solve

$$\sqrt[3]{4-x} + 2 = 4$$

$$\sqrt[3]{4-x} = 2$$

$$4-x = 2^3 = 8$$

$$-x = 4$$

$$x = -4$$

7. Fully simplify the following expression. Your final answer should have no fractional exponents.

$$\frac{(2^2 x)^{\frac{1}{3}} y}{y^{\frac{4}{3}}}$$

$$\frac{2^{\frac{2}{3}} x^{\frac{1}{3}} y}{y^{\frac{4}{3}}} = \frac{\sqrt[3]{2^2 x}}{y^{\frac{1}{3}}} = \frac{\sqrt[3]{4x}}{\sqrt[3]{y}}$$

8. Find the inverse of  $c(x) = 4 - \sqrt{x}$ . What are the domain and range of  $c^{-1}(x)$ ?

$$y = 4 - \sqrt{x}$$

$$\sqrt{x} = 4 - y$$

$$c^{-1}(y) = x = (4 - y)^2$$

$$c^{-1}(x) = (4 - x)^2$$

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$$\text{dom } c^{-1} = \text{ran } c : x \leq 4$$

$$\text{ran } c^{-1} = \text{dom } c : y \geq 0$$

9. Find the inverse of  $d(x) = \sqrt[3]{5+x} + 1$ .

$$y = \sqrt[3]{5+x} + 1$$

$$y - 1 = \sqrt[3]{5+x}$$

$$(y - 1)^3 = 5 + x$$

$$d^{-1}(y) = x = (y - 1)^3 - 5$$

$$d^{-1}(x) = (x - 1)^3 - 5$$

10. Solve

$$(2\sqrt{2+x})^2 = (\sqrt{3-x})^2$$

$$4(2+x) = 3-x$$

$$8+4x = 3-x$$

$$5x = 3-8$$

$$= -5$$

$$\underline{x = -1}$$

check not a false solution:

$$2\sqrt{2-1} = 2\sqrt{1} = 2$$

$$\sqrt{3-1} = \sqrt{2} = 2$$

11. Extra Credit (up to +5): Give a function  $e(x)$  whose domain is all real numbers and whose range is all positive numbers so that  $e(x)$  turns addition into multiplication:  $e(x+y) = e(x) \times e(y)$ .

this is a property of exponentiation:

$$a^{x+y} = a^x \cdot a^y$$

so  $e(x) = a^x$  works.

# Make-up questions for quiz 1

1		
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2		
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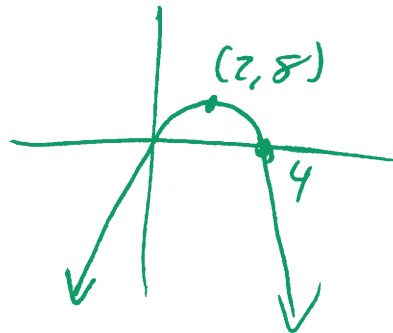
1. Find the x-intercepts and vertex of the following function. Sketch a graph.

$$y = 8x - 2x^2$$

$$y = 2x(4-x)$$

$$\text{intercepts: } x=0, x=4$$

$$\text{vertex @ } x = \frac{-8}{-4} = 2 \quad y = 16 - 8 = 8$$

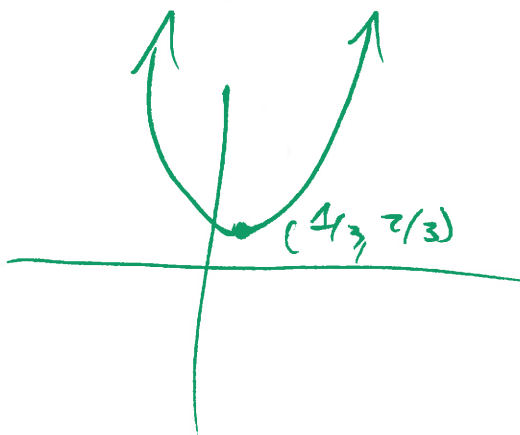


2. Find the vertex of the following function. Sketch a graph.

$$y = 3x^2 - 2x + 1$$

$$\text{vertex @ } x = \frac{-2}{2 \cdot 3} = \frac{1}{3} \quad y = 3\left(\frac{1}{3}\right)^2 - \frac{2}{3} + 1$$

$$= \frac{1}{3} - \frac{2}{3} + 1 = 1 - \frac{1}{3} = \frac{2}{3}$$



(Extra space. Label which question the work is for.)