MA161 Quiz 1Solutions

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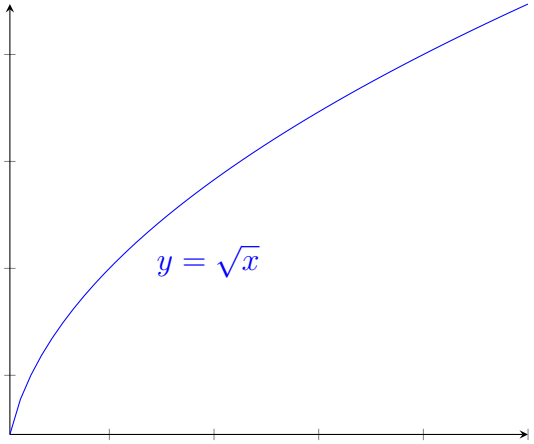
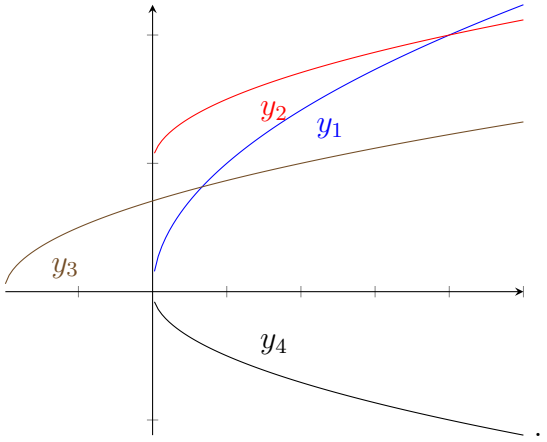
January 11, 2018

Problem 1.1. Given that the graph of $y = \sqrt{x}$ is sketched below,



match the functions (a) $y = \sqrt{x} + 2$, (b) $y = \sqrt{x+2}$, (c) $y = -\sqrt{x}$, and (d) $y = 2\sqrt{x}$ to their corresponding graph below



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(Write your answers, for example, in the form (a)-y_1.)

Solution. I had originally made a typo in the classroom, where I said "find the graph of $y = \sqrt{x} - 2$" when I meant "find the graph of $y = \sqrt{x} + 2$." This has been corrected in this version of the quiz.

The solutions were (a) y_2, (b) y_3, (c) y_4, and (d) y_1. Remember, when you add a number to the argument, you shift the graph to the right by that factor and to the left by that factor. When you add a number to the graph itself, you shift the graph up by that number (down if you subtract). And when you scale, the graph opens wider if the scale is bigger than 1 and squeezes if it is lless than 1. To get the graph opening up down, you multiply by -1. 😄

Problem 1.2. Given that $f(x) = a^x$, show that

$$\frac{f(x+h) - f(x)}{h} = a^x \cdot \frac{a^h - 1}{h}.$$

Solution. All I wanted to see in this problem was that you remembered your exponent rules and how to work with functions. The steps were

$$\frac{f(x+h) - f(x)}{h} = \frac{a^{x+h} - a^h}{h} = a^x \cdot \frac{a^h - 1}{h}.$$ 😄

Problem 1.3. Which of the following statements are true:

(a) $\sin x$ can be greater than 1.

(b) $\tan x$ is always less than 1.

(c) e^x is always positive.

(d) $\log x$ is negative for $x < 1$.

Solution. I mentioned this during class, $\sin x$ can only take values between -1 and 1 so (a) is false. Since $\tan x$ is the quotient of $\sin x$ by $\cos x$ and these can be almost anything, $\tan x$ can actually take any value at all. 😄