Final answers script in beta

Final Answers
MATH110 December 2010

How to use this resource

- When you feel reasonably confident, simulate a full exam and grade your solutions. For your grading you can get the full solutions here.
- If you're not quite ready to simulate a full exam, we suggest you thoroughly and slowly work through each problem. Use this document with the final answers only to check if your answer is correct, without spoiling the full solution.
- Should you need more help, check out the hints and video lecture on the Math Educational Resources.

Tips for Using Previous Exams to Study: Work through problems

Resist the temptation to read any of the final answers below before completing each question by yourself first! We recommend you follow the guide below.

1. **How to use the final answer:** *The final answer is not a substitution for the full solution!* The final answer alone will not give you full marks. The final answer is provided so that you can check the correctness of your work without spoiling the full solution.
   - To answer each question, only use what you could also use in the exam. Download the raw exam here.
   - If you found an answer, how could you verify that it is correct from your work only? E.g. check if the units make sense, etc. Only then compare with our result.
   - If your answer is correct: good job! Move on to the next question.
   - Otherwise, go back to your work and check it for improvements. Is there another approach you could try? If you still can't get to the right answer, you can check the full solution on the Math Educational Resources.
2. **Reflect on your work:** Generally, reflect on how you solved the problem. Don't just focus on the final answer, but whether your mental process was correct. If you were stuck at any point, what helped you to go forward? What made you confident that your answer was correct? What can you take away from this so that, next time, you can complete a similar question without any help?
3. **Plan further studying:** Once you feel confident enough with a particular topic, move on to topics that need more work. Focus on questions that you find challenging, not on those that are easy for you. Once you are ready to tackle a full exam, follow the advice for the full exam (click here).

Please note that all final answers were extracted automatically from the full solution. It is possible that the final answer shown here is not complete, or it may be missing entirely. In such a case, please notify `mer-wiki@math.ubc.ca`. Your feedback helps us improve.

This pdf was created for your convenience when you study Math and prepare for your final exams. All the content here, and much more, is freely available on the Math Educational Resources.

Question 1 (a)

FINAL ANSWER. $\lim_{x\to\infty} \frac{17x+1}{x} = 17.$

Question 1 (b)

FINAL ANSWER. b) The function $f(x) = \sqrt[3]{x}$ is continuous, but has a vertical tangent line at $x = 0$. = is continuous, but has a vertical tangent line at $x = 0$.Thus it is clear that there are continuous functions that are not differentiable, so the statement Not all continuous functions are differentiable is true.To prove this, it is sufficient to give an example of a function that is continuous but not differentiable, like one of the functions shown above.

Question 1 (c)

FINAL ANSWER. More generally, if $f(x) = p(x)$ and $g(x) = p(x) + c$ where $p(x)$ is a differentiable function, then $f'(x) = p'(x)$ but $f(x) \neq g(x)$.

Question 2 (a)

FINAL ANSWER. $f'(x) = 19x^{18} \quad \text{if } x \neq 0$

Question 2 (b)

FINAL ANSWER. $\frac{\cos x+2x\sin x}{2\sqrt{x}\cos^2 x}$

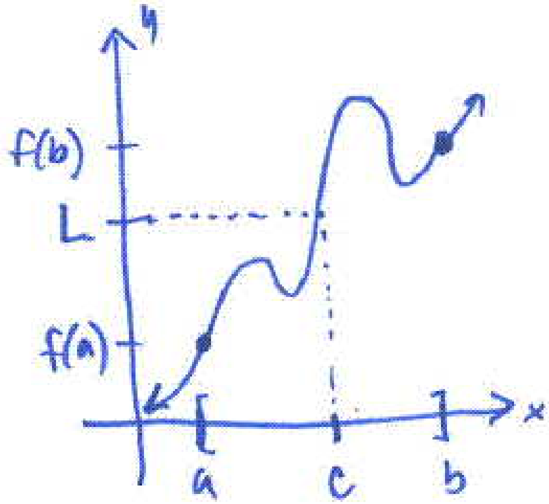
Question 2 (c)

FINAL ANSWER. $f'(x) = \sec^2(\tan(\tan(x^2))) \cdot \sec^2(\tan(x^2)) \cdot \sec^2(x^2) \cdot 2x.$

Question 3 (a)

FINAL ANSWER. Then there is at least one number c in $[a, b]$ satisfying $f(c) = L$.

Question 3 (b)



Final answer.

Question 3 (c)

Final answer. Here we have what would be a continuous function (the function x) - we've just removed the one point where it would equal zero and moved that point somewhere else, in this case, to $y = 1$.You could come up with many other piecewise functions using these same ideas.

Question 4 (a)

Final answer. See as $x \to a$, the slope of the line between $(a, f(a))$ and $(x, f(x))$ approaches the slope of the tangent line at $x = a$.

Question 4 (b)

Final answer. $f'(0) = 2$

Question 5 (a)

Easiness: 39/100

Final answer. These two y-values are equal, so the curves do intersect at $x = 3$.

Question 5 (b)

Final answer. For this problem, this relationship is true: the first slope, $\frac{1}{5}$ is the negative reciprocal of -5. Thus the tangent lines to these two curves are perpendicular at $x = 3$.

Question 5 (c)

Final answer. Thus the curve $y = x^2 - x$ satisfies both of our conditions and intersects orthogonally the curve $y = \sin x$ at $x = 0$.

Question 6 (a)

FINAL ANSWER. In this case, a single x-value in the domain will be associated with two y-values from the upper and lower half of the circle. This is the same as saying that a circle fails the vertical line test, as a vertical line drawn through any point in the domain will intersect the graph in two places.

Question 6 (b)

FINAL ANSWER. $y + 4 = \frac{3}{4}(x - 3)$

Question 6 (c)

FINAL ANSWER. In this case, we have slope $-\frac{4}{3}$ and the line from part (b) has slope $\frac{3}{4}$.These two numbers are negative reciprocals so the two lines are perpendicular.

Question 7

FINAL ANSWER. So $a = -\frac{3}{2}$ and $b = \frac{5}{2}$ are values that satisfy the conditions that $f(x)$ be continuous and differentiable.

Question 8 (a)

FINAL ANSWER. $g'(\frac{\pi}{3}) = -\dfrac{\sqrt{3}}{2}$

Question 8 (b)

FINAL ANSWER. $y = -\frac{5}{2}x + \left(\frac{5\pi}{6} + \frac{5\sqrt{3}}{4}\right)$

Question 9 (a)

FINAL ANSWER. $(-\infty, \infty)\backslash\{1\}$

Question 9 (b)

FINAL ANSWER. $\frac{1}{.01} = 100$we can see that entire function is large - in fact it's a large integer, not even a fraction anymore.

Question 9 (c)

FINAL ANSWER. So the y-intercept is $(0, -1)$.

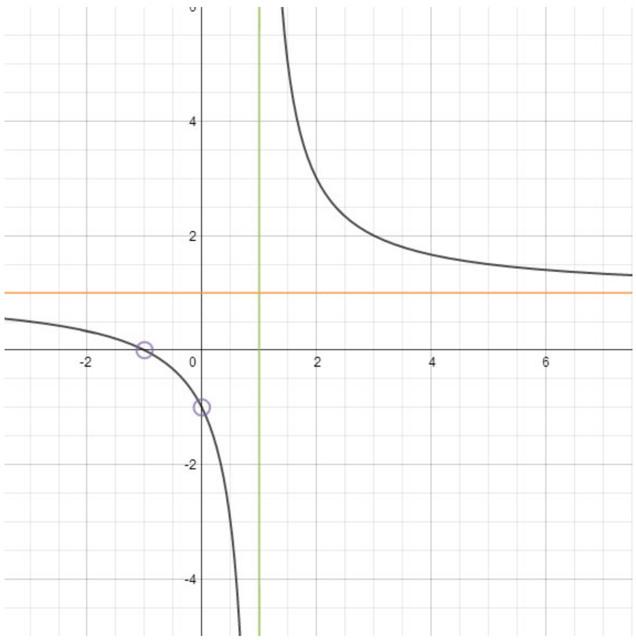
Question 9 (d)

FINAL ANSWER. As it turns out, there are no x-values that will satisfy this equation. Thus our only critical point is at $x = 1$.

Question 9 (e)

Final answer. This means that the function $f(x)$ is decreasing, on the interval $(\infty, 1) \cup (1, \infty)$.

Question 9 (f)

Final answer. 

Question 10

Final answer. So there are an infinite number of solutions, $0, 2\pi, 4\pi, \ldots$ and so the curve has an infinite number of horizontal tangent lines.