Final Answers
MATH104 December 2012

April 4, 2015

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 Education 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 Education 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 Education Resources.

Question 1 (a)

Final answer. Therefore, $\lim_{x\to 0} \frac{\sqrt{x+1}-1}{x} = \frac{1}{2}$

Question 1 (b)

Final answer. Therefore, $a = -e = a = -e$.

Question 1 (c)

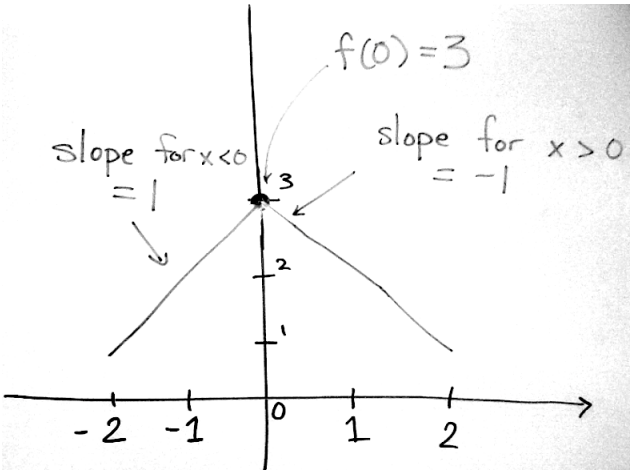
Final answer. $f'(x) = (x+1)^{\cos(x)} \left(\frac{\cos(x)}{x+1} - \sin(x)\ln(x+1) \right)$

Question 1 (d)

Final answer. $h'(1) = 5e^2 + 20$ Therefore, $h'(1) = 5e^2 + 20$.

Question 1 (e)

Final answer.



Question 1 (f)

Final answer. $r^2 - 4r + 4 = 0$. Thus, the value of r that satisfies the given equation is $r = 2$.

Question 1 (g)

Final answer. $T_2(x) = \frac{\pi}{4} + \frac{1}{2}(x-1) - \frac{1}{4}(x-1)^2$.

Question 1 (h)

Final answer. $|R_1(0.25)| \leq \frac{M}{2}|0.25-0|^2 = \frac{1}{32}$completing the question.

Question 1 (i)

FINAL ANSWER. $a_{20} = \dfrac{3^{20}e^3}{20!}$ which completes the problem.

Question 1 (j)

FINAL ANSWER. $\rightarrow \quad t = \frac{100}{7}\ln\left(\frac{10}{7}\right) \quad (\approx 5.10)$ Therefore, we would need to wait (100/7)ln(10/7) years for our initial investment to be growing at a rate of \$10,000 per year so we can retire.

Question 1 (k)

FINAL ANSWER. where the values of $q(10) = 2$ are read from the given degree 2 Taylor polynomial expansion and similarly for $q'(10)$.

Question 1 (l)

FINAL ANSWER. $\lim_{x\to a} f(x) = f(a)$ must be satisfied. Therefore, (i) is the answer.

Question 1 (m)

FINAL ANSWER. Therefore, $f(t)$ is increasing for $t < -2$, $t > 0$ and decreasing for $0 < t < 2$.

Question 1 (n)

FINAL ANSWER. $f'(x) = \frac{1}{1+\ln(1+\ln(x))} \cdot \frac{1}{1+\ln(x)} \cdot \frac{1}{x}$.

Question 1 (o)

FINAL ANSWER. $f(c) = 5^c - 7c - 10 = 0$ by the Intermediate Value Theorem.

Question 2 (a)

FINAL ANSWER. On this interval, we have that at the point $x = 4$ that the numerator is $2(4)^2((4)^2 - 9) = 224 > 0$ and so the function is increasing on this interval.This completes the problem.

Question 2 (b)

FINAL ANSWER. On this interval, we have that at the point $x = 2$ that the second derivative is $\dfrac{4(2)((2)^2+9)}{((2)^2-3)^3} = (8)(13) > 0$ and so the function is concave up on this interval.This completes the problem.

Question 2 (c)

FINAL ANSWER. **(Notice that $x = \pm\sqrt{3}$ are not points in the domain and hence cannot be extrema or inflection points.)**

Question 2 (d)

FINAL ANSWER. Therefore, y = (2/3)x is a slant asymptote of f(x).

Question 2 (e)

FINAL ANSWER. The slant asymptote on g is incorrect and hence this leave the correct answer e.

Question 3

FINAL ANSWER. The corresponding value of bolts is $y = 125$.Therefore, we should sell 75 nuts and 125 bolts to maximize revenue.

Question 4 (a)

FINAL ANSWER. $\frac{dq}{dp} = \frac{1}{4}(-2-3) \quad \rightarrow \quad \frac{dq}{dp} = -\frac{5}{4}$

Question 4 (b)

FINAL ANSWER. $\epsilon(p) = \dfrac{-5}{2} < -1$As the value is less than -1, we see that the revenue will decrease.

Question 4 (c)

FINAL ANSWER. $\frac{dp}{dt} = -0.05$ So the rate in price must be changed by a decrease of 5 cents (0.05 dollars) per hour completing the question.

Question 5 (a)

FINAL ANSWER. $\frac{d}{dt}(C+D) = -11$.

Question 5 (b)

FINAL ANSWER. $\frac{dy}{dt} = -3$ and so Bob is walking **towards** the lamppost at 3ft/s.Notice the sign we get makes sense because we are told that each person is walking towards the lamp in the question!

Question 6 (a)

FINAL ANSWER. Hence, $f'(1) = 0$.

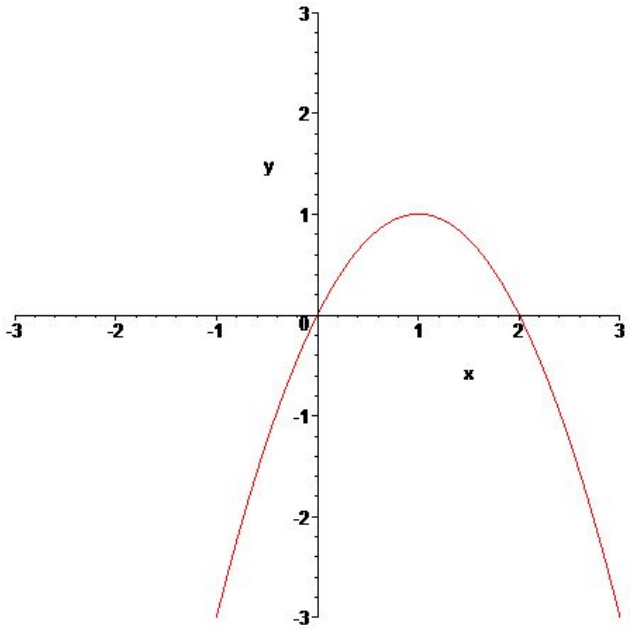
Question 6 (b)

FINAL ANSWER. and so $f''(1) = -2$

Question 6 (c)

FINAL ANSWER. This tells us that points near x=1 are smaller than what the tangent line predicts and therefore we expect that our estimate is an overestimate.

Question 6 (d)



FINAL ANSWER.