Final Answers
MATH110 April 2011

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. Then the linear approximation L coincides with f at all points.

Question 1 (b)

Easiness: 90/100

FINAL ANSWER. Where clearly the derivative is never zero, even though $f(0) = 1$.Either example (or a similar example) would suffice to prove the statement false.

Question 1 (c)

FINAL ANSWER. It has a horizontal tangent line at $x = 0$ (making $x = 0$ a critical point) and also changes concavity at $x = 0$.Thus the statement is **true**.

Question 2 (a)

FINAL ANSWER. $\lim_{x\to\pi^+} \cos x = -1$ which is also the value of the original limit.

Question 2 (b)

FINAL ANSWER. $\lim\limits_{x\to 0^+} \dfrac{\ln(\sin x)}{\ln(\cos x)} = +\infty$

Question 3 (a)

Easiness: 100/100

FINAL ANSWER. `Suppose a function` f `is continuous on the interval [a,b].`
`Suppose further that` f `is differentiable on the interval (a,b).`
`Then there exists some c in the interval (a,b) satisfying`

$f'(c) = \frac{f(b)-f(a)}{b-a}$.

Question 3 (b)

Easiness: 62/100

FINAL ANSWER. $\cos(c) = \frac{\sin(b)}{b}$

Question 3 (c)

Easiness: 37/100

FINAL ANSWER. $\sin(b) \leq b$ Which completes our proof.

Question 4 (a)

FINAL ANSWER. $y' = \frac{-x^3}{y^3}$

Question 4 (b)

FINAL ANSWER. $y'' = \frac{3x^2(-y+xy')}{y^4}$

Question 4 (c)

FINAL ANSWER. $K = \frac{-3}{\sqrt{2}}$.

Question 5

Easiness: 5/100

FINAL ANSWER. $\frac{S(25)}{S(0)} = (1/2)^{25/29}$

Question 6

Easiness: 50/100

FINAL ANSWER. in terms of r, as desired.

Question 7 (a)

Easiness: 100/100

FINAL ANSWER. Solving for y gives us $y = mx - m + 1$

Question 7 (b)

FINAL ANSWER. and our x-intercept is $\left(\frac{m-1}{m}, 0\right)$.

Question 7 (c)

FINAL ANSWER. However, as stated in the question, $m < 0$, so the only valid critical point is $m = -1$.To check that this is a minimum, you could use the first or second derivative test.

Question 8 (a)

FINAL ANSWER. If we choose $-2 < x < 2$ we find that the left hand side of the inequality is positive, satisfying the inequality. Thus our domain is $-2 < x < 2$, which written in interval notation is $(-2, 2)$.

Question 8 (b)

FINAL ANSWER. Since the function is only defined in the interval $(-2, 2)$, which is bound on both sides, the function does not have horizontal asymptotes.

Question 8 (c)

FINAL ANSWER. Therefore the y-intercept is $y = \ln 4$.

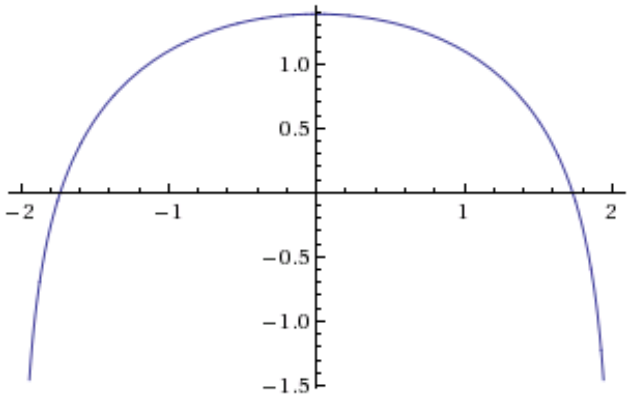
Question 8 (d)

FINAL ANSWER. This also means that f has a local maximum at $x = 0$.

Question 8 (e)

FINAL ANSWER. and hence f is concave down on its whole domain.

Question 8 (f)



FINAL ANSWER.

Question 9

FINAL ANSWER. $\frac{dd}{dt} = \frac{600 \cdot 600 + 100 \cdot 100}{\sqrt{16 + 600^2 + 100^2}} \approx 608.26\,\text{km/h}$ (As mentioned in the problem, you don't need to compute the answer, I just added it to give you a sense of the value.)