QUEEN'S UNIVERSITY
APSC 171J – Assignment 2
Wesley Burr
Due: January 24, 2013

INSTRUCTIONS

- This assignment is due in-class (4:30-5:20pm) Thursday, January 24
- Answer all questions, writing clearly on the sheets provided. **You must print this file and hand in a carefully stapled copy!** Unstapled assignments will not be accepted.
- One mark in each question is for **complete** (and mostly correct) work shown
- The second mark is for a **fully** correct solution, which **must** be placed in the box provided
- Whenever possible, simplify your solution.
- There are no part marks: you will receive 0, 1 or 2 on each question.

FOR INSTRUCTOR'S USE ONLY		
Question	Mark Available	Received
1	2	
2	2	
3	2	
4	2	
5	2	
6	2	
7	2	
8	2	
9	2	
10	2	
TOTAL	20	

1. [2 marks] Find $\frac{dy}{dx}$ if

$$y(x) = \int_0^{\ln(x)} e^{\sin(t)} dt.$$

Final Answer:

2. [2 marks] Find $\frac{dy}{dx}$ if

$$y(x) = (1 + x^2)^{\sin(x)}.$$

Final Answer:

3. [2 marks] Find $\frac{dy}{dx}$ if

$$xy^2 - x^2y = 6$$

and evaluate the derivative at $(x, y) = (2, 3)$.

Final Answer:

4. [2 marks] A student who is 5′ (feet) tall is walking down a sidewalk away from a lamppost which is 15′ (feet) tall. If she is moving at 2 feet/second when she is 10′ (feet) from the base of the lamppost, how fast is the tip of her shadow moving (where the tip of her shadow represents her 'head').

Final Answer:

5. [2 marks] A gas pipeline is to be constructed from a storage tank which sits at the edge of a road. This pipeline is to run to a house which is 200m down the road and 100m back from the road (perpendicularly). Pipe laid along the road costs $\$400$ / meter, while pipe laid off-road costs $\$500$ / meter. Find the minimum cost of laying the pipeline.

Final Answer:

6. [2 marks] Find all local minima and maxima of the function

$$y(x) = 2x^3 - 9x^2 + 12x - 3.$$

Final Answer:

7. [2 marks] Find $\frac{dy}{dx}$ for

$$y(x) = 2 + \int_1^{\cos(x)} \sqrt{1 - t^2}\, dt.$$

Final Answer:

8. [2 marks] Find $\dfrac{dy}{dx}$ for

$$\arctan(x+y) = xy.$$

Final Answer:

9. [2 marks] Find $\dfrac{dy}{dx}$ for

$$y(x) = x^{1/e^x} = x^{e^{-x}}.$$

Final Answer:

10. [2 marks] A rectangular beam is cut from a cylindrical log with radius 100 cm. The strength of the beam is proportional to the product of the width w and the square of the height h of the cross-section. Find the dimensions of the strongest beam that can be cut from the given log.

Final Answer: