SIMON FRASER UNIVERSITY

Faculty of Science
Department of Mathematics
MATH 154 - D100
Midterm 2 va

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Instructor: Date: March 15, 2017

Instructions:

1. Do not open this booklet until told to do so.
2. Print your information legibly, correctly, and using large font on the lines provided above.
3. Please write rmly so that scanning picks up on your writing. Cross out unwanted work (do not erase). If extra space is needed use the last page and indicate where your work continues.
4. This exam contains 5 questions. Check to make sure your exam is complete.
5. Full marks are reserved for answers that are correct in all essential details, clearly indicate the method used, and could be understood by another student without undue e ort.
6. **Only** scienti c calculators with no graphing, and programming capabilities are allowed. **All other electronic devices must be turned o !**
7. No books, papers or electronic devices shall be within reach of a student during the examination.
8. This exam is administered under the SFU Code of Academic Honesty. In particular communicating with, copying from, or deliberately exposing written papers to the view of, other examinees is forbidden.

Question	Maximum	Score
1	6	
2	10	
3	9	
4	8	
5	7	
Total	40	

1. True-False. Circle \T" for true or \F" for false. For this section, you do not need to justify your answers.

[1] (a) **T** or **F** : The function $f(x) = x^2$ has a point of in ection at $x = 0$.

[1] (b) **T** or **F**: The equation $y \quad f(x_0) = f'(x_0)(x \quad x_0)$ is the equation of the tangent line to the curve of $y = f(x)$ at point the $x = x_0$.

[1] (c) **T** or **F**: Every continuous function on a closed interval has a critical point.

[1] (d) **T** or **F**: If a function $f(x)$ satis es $f''(x_0) = 0$, then f has a point of in ection at x_0.

[1] (e) **T** or **F**: The tangent line to the curve of $y = f(x)$ at the point x_0 is the line with slope $f'(x_0)$ passing through point $(x_0; f(x_0))$.

[1] (f) **T** or

2. Practice of de nitions and concepts.

[3] (a) Find all critical points of the function $f(x) = x^3 + 2x^2 + ax$ 3 based on the constant a.

[3] (b) Find the linearization of the function $f(x) = \sqrt{x + 3}$ at $a = 1$ and use this to approximate $\sqrt{3.98}$.

[4] (c) Compute the derivative of the function $f(x) = \ln(x^3 + 5x)$ e^{2x^3} ^{2x}.

3. Consider the function $f(x) = x^{2=3}(6 \quad x)^{1=3}$ with rst derivative $f^{0}(x) = \frac{4 \quad x}{x^{1=3}(6 \quad x)^{2=3}}$ and second derivative $f^{00}(x) = \frac{8}{x^{4=3}(6 \quad x)^{5=3}}$.

[3] (a) Determine the intervals on which f is increasing and those on which f is decreasing.

[2] (b) Determine all points at which f has a local maximum/minimum.

[4] (c) Determine the intervals on which f is concave up and those on which f is concave down. Then determine in ection points of f.

5. An air is being pumped into a spherical balloon so that its volume $V = \frac{4}{3} r^3$ increases at a rate of 100 cm^3 per sec. How fast is the radius of the balloon increasing when its diameter is 50 cm?

[3] (a) Draw a gure representing the problem, and state the known and unknown rates.

[2] (b) Find the equation that relates the variables of known and unknown rates.

[2] (c) Solve the equation above and answer the question.

Use space below if you need extra space to show your work