Saint Mary's University

Department of Mathematics and Computing Science

Name:		
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Math 1251: Calculus for Life Sciences II

Midterm Test February 28, 2018

Instructor: J. Irving

Instructions:

- No electronic devices, or aids of any kind, are permitted.
- There are 4 pages plus this cover page. Check that your test paper is complete.
- There are a total of 60 points. The value of each question is indicated in the margin.
- Answer in the spaces provided, using backs of pages for additional space if necessary.
- Show all your work. Insufficient justification will result in a loss of points.

Page	Maximum	Your Score
1	19	
2	13	
3	12	
4	16	
Total	60	

1. Compute:

[7] (a)
$$\int \left(1 - \frac{x}{2} + \frac{3}{x} - 4x^4 + \frac{5}{\sqrt[3]{x}} - e^{6x} + \sin 7x\right) dx$$

[4] (b)
$$\int_0^1 t^2 (1 - \sqrt{t}) dt$$

[8] 2. Find the area of the region bounded between the curves y = x + 1 and $y = x^2 - x - 2$. Your solution should include an appropriately labelled sketch of the region.

[4] 3. Approximate $\int_{1}^{3} \sqrt{1+x} \, dx$ by a Riemann sum with N = 4 subintervals, using right-endpoints. Do not evaluate the sum!

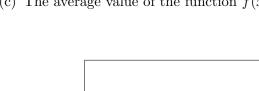
4. Give expressions in terms of definite integrals for the following.

Do not evaluate your integrals!

(a) The distance travelled over the first 10 seconds by a particle moving in a straight line whose velocity after t seconds is $1 - e^{-t}$ m/s.

(b) The volume of the solid obtained by revolving the portion of the curve $y = \ln x$ between x = 1 and x = e around the x-axis.

(c) The average value of the function $f(x) = \sqrt{1+x^2}$ over the interval [1,4].



[3]

[3]

[8] 6. Find all critical points of $f(x, y) = 10 - x^2 + 2xy - 3y^2 - 4x + 16y$ and use the second derivative test to classify them as maxima, minima, or neither. Clearly explain your reasoning.

7. Compute:

[5] (a)
$$\int_0^1 \frac{x^3}{(1+3x^4)^2} dx$$

 $[5] (b) \int x e^{2x} dx$

[6] 8. The region R of the (x, y)-plane is shaded in the sketch below. Find the volume of the solid over R that is bounded above by $f(x, y) = 1 - 2x^2y$.

