Okanagan College

Math 112 (071) Winter 2009

Term Test Two – Marksheet

Instructor: Clint Lee

Thursday, March 12

Student Name: _____ Total Marks: _____ 40

Problem	Marks	
1 (a)	/1	
1 (b)	/2	
1 (c)	/1	
1 (d)	/1	
1 (e)	/2	
1 Total		/7
2 (a)	/3	
2 (b)	/3	
2 (c)	/3	
2 Total		/9
3 (a)	/4	
3 (b)	/2	
3 (c)	/2	
3 Total		/8
4 Total		/3
5 (a)	/3	
5 (b)	/5	
5 Total		/8
6 (a)	/2	
6 (b)	/3	
6 Total		/5
Exam Total		/40

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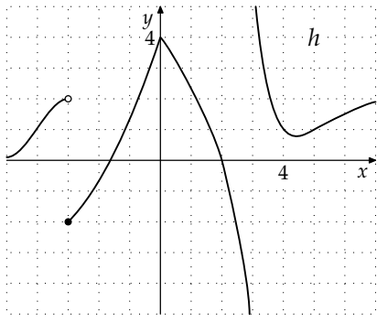
Instructions. Do all parts of all 6 questions. Show all work and give explanations where required. You may receive part marks for a question if your work is correct even if the final answer is incorrect. However, if your answer is incorrect and no work or explanation is given, you will receive no marks. The number of points for each question is given in the left margin, total 40.

1. The graph of a function h is shown. In parts (a) to (e) give the value of each quantity, or explain why the quantity does not exist.



[1] (a) $\lim_{x \to 0} h(x)$

[2] (b) $\lim_{x \to 4^+} h(x)$

[1] (c) $\lim_{x \to -\infty} h(x)$

[1] (d) $h(-3)$

[2] (e) Identify all of the vertical and horizontal asymptotes of the graph of h. Draw each asymptote on the given graph of h.

2. Evaluate each limit, or explain why the limit does not exist. If the limit is infinite, express the limit as $\pm\infty$ or explain why it does not exist.

[3] (a) $\lim_{x\to 2} \dfrac{x^2+x-6}{x^2+4}$

[3] (b) $\lim_{x\to -1} \dfrac{x^2+4x+3}{2x^2+x-1}$

[3] (c) $\lim_{x\to -3^+} \dfrac{x+1}{x^2-9}$

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3. Let

$$p(x) = \frac{2x}{x-2}$$

[4] (a) Use the limit definition of the derivative

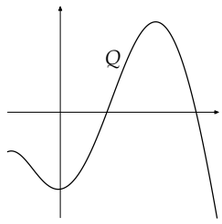
$$p'(x) = \lim_{h\to 0} \frac{p(x+h)-p(x)}{h}$$

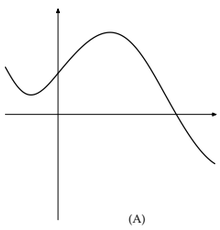
to find a formula for $p'(x)$.

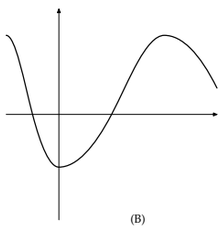
[2] (b) Use differentiation rules to verify your answer in part (a) above for $p'(x)$.

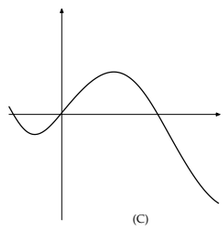
[2] (c) Use your answer in parts (a) or (b) to find the equation of the line tangent to the graph of p where $x = 4$.

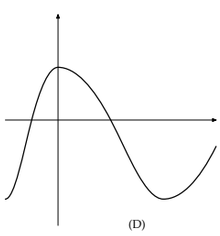
[3] 4. The graph of a function Q is shown at the right. The graphs of six other functions are shown below. Select the one graph that is the graph of the derivative Q'. Explain your choice.

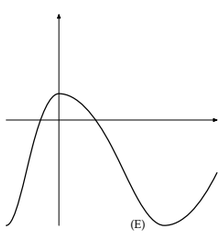


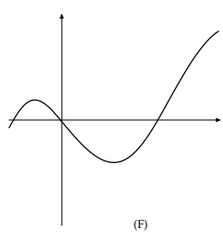

(A)


(B)


(C)


(D)


(E)


(F)

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5. Find the indicated derivative(s) for each function. Simplify only if required.

[3] (a) Find $\dfrac{dy}{dx}$ for $y = 6\sqrt[3]{x^2} + 2e^{-3x} - \dfrac{3}{x^5}$.

[5] (b) Find and simplify $g'(x)$ and $g''(x)$ for $f(x) = \left(x^2 - 2x + 3\right) e^x$.

6. A chemistry student is doing a summer study of the mercury concentrations in a small alpine lake. Runoff from the surrounding snow pack deposits mercury in the lake during the height of the summer, but as the runoff decreases some of the mercury is flushed out of the lake as a result of the stream that flows out of the lake. The student takes readings every 10 days during the 90 day study. The data in the table below gives the average mercury concentration C, in mg/m^3 (milligrams per cubic metre), from samples taken at several locations and depths in the lake.

t, days	0	10	20	30	40	50	60	70	80	90
C, mg/m^3	100	108	125	132	126	105	98	90	85	83

[2] (a) Give the average rate of change of the mercury concentration in the lake during the first 30 days of the study, that is, from $t = 0$ to $t = 30$. Give the units of this rate of change.

[3] (b) Estimate the instantaneous rate of change of the mercury concentration in the lake after 50 days, that is, at $t = 50$. Explain what this rate of change tells you.