CAMOSUN

Mathematics 100 Test #2A **Name:** _____

Instructor: George Ballinger **Section:** _____
Term: Fall, 2017

The Sharp EL-531 calculator may be used on this test.
You may not use L'Hôpital's Rule when evaluating limits.
Show all of your work in the space provided.
The number of marks for each question is indicated in brackets.

Mark: $\frac{\quad}{25}$

1. Fill in the blanks with meaningful answers. No justification is required.

   (a) The formula for Newton's Method is $x_{n+1} =$ _____.

   (b) The conclusion of Rolle's Theorem states that there is some c in (a,b) such that _____.

   (c) If c is a critical number of f then $f'(c)$ is either undefined or _____.

[3]

   (d) If f' is increasing, then the graph of f is said to be _____.

   (e) If f is continuous on $[a,b]$ and $f'(x) < 0$ for all x in (a,b), then f is _____ on $[a,b]$.

   (f) The differential of $V = \frac{4}{3}\pi r^3$ is $dV =$ _____.

2. Find the limit and show your work. If the limit does not exist, then answer ∞ or $-\infty$ if applicable.

   (a) $\lim\limits_{x\to\infty} \dfrac{-9x^2+6x}{7x^2+7}$

[1]

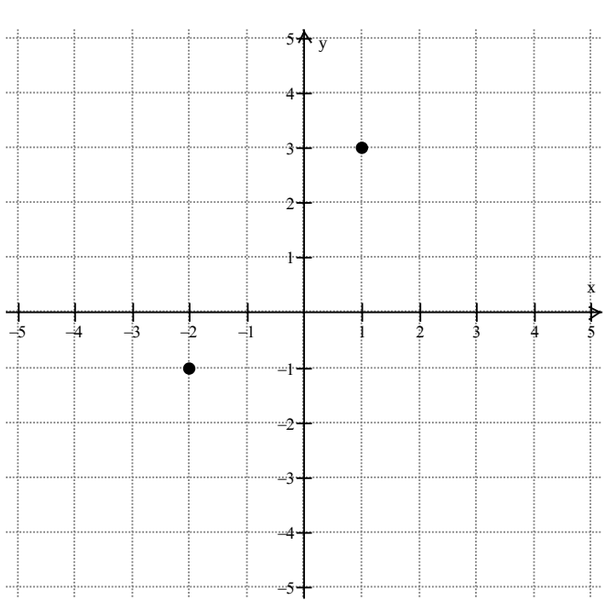
   (b) $\lim\limits_{x\to-\infty} \dfrac{\sqrt{x^2+1}}{x}$

[2]

3. Sketch the graph of a **continuous** function f that passes through the indicated points and that satisfies all of the following properties. Your graph should clearly show the increasing, decreasing and concave structure of f.

$f'(-2)$ is undefined
$f'(1) = 0$

Interval	$(-\infty, -2)$	$(-2, 1)$	$(1, \infty)$
Sign of $f'(x)$	–	+	–
Sign of $f''(x)$	+	–	–



[2]

4. Find the absolute maximum and minimum values of $f(x) = \frac{1}{2}\sin 2x - \sin x$ on the interval $[0, \pi]$.

[5]

5. Find the slope of the tangent line to the curve $xy = \sin(x - y)$ at the origin.

[3]

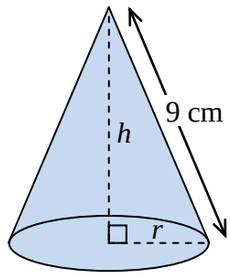
6. Given the following function and its first two derivatives,

$$f(x) = \frac{x-1}{(x+3)^3}, \qquad f'(x) = \frac{-2(x-3)}{(x+3)^4}, \qquad f''(x) = \frac{6(x-5)}{(x+3)^5}.$$

find the intervals on which the graph of *f* is concave upward or concave downward and find the coordinates of any inflection points.

[3]

7. Find the maximum volume of a right circular cone if its slant height is 9 cm as shown in the figure. Use the Second Derivative Test to verify that your answer is indeed a maximum.



[6]