BC: Q201 EXAMINATION REVIEW PRACTICE
(PART 1) BC: Q201 – EXAMINATION REVIEW PRACTICE (Lessons 1 – 3)

TECHNOLOGY SECTION: *Round answers to three decimal places.*

1. The velocity of a particle moving along a horizontal is given as $v(t) = 8\cos(t) + \ln\left(\sin(t) + t^2\right)$ on $0.1 < t \leq 8$.

A. On what time interval is the particle moving to the right? Justify.

B. What are the velocity and acceleration at time $t = 5$? Round answers to three decimal places.

C. Is the particle speeding up or slowing down at $t = 3.5$? Justify.

2. The derivative of *f* is given by $f'(x) = e^{x^2} - 5x^3 + x$ on $0 \leq t < 3$

A. On what interval is *f* decreasing? Justify.

B. At what *x*-value(s) does *f* have a relative maximum? Justify.

C. On what interval is *f* concave upward? Justify.

NO TECHNOLOGY SECTION

1. Let *f* be defined by $f(x) = \ln(2 + \sin x)$ for $\pi \le x \le 2\pi$.
Find the absolute maximum value and the absolute minimum value of *f* using the closed interval test.

2. A. When is the graph of $f(x)$ concave upward if $f''(x) = (x-1)(x+2)^2 e^{x^2}$. Justify.
B. How many points of inflection are on *f*? Justify.

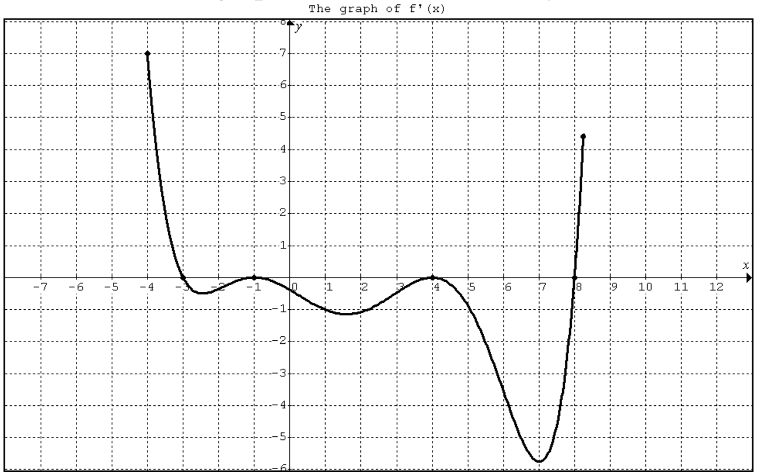
3. A particle moves along a horizontal line. It's position at time t is given as

$$s(t) = \frac{2}{3}t^3 - \frac{5}{2}t^2 - 3t \ .$$

On what time interval is the particle slowing down? Justify.

4. Consider the graph of the *derivative* of *f* below.

The graph of f'(x)



A. For what *x* – values does *f* have a local minimum? Justify.

B. On what interval is *f* increasing? Justify.

C. On what interval is *f* concave upward? Justify.

D. How many points of inflection are on *f*?

(**PART 2) BC: Q201 – EXAMINATION REVIEW PRACTICE (Lessons 4 and 5)**

OPTIMIZATION

5. Pg. 226 #6 (NO CALCULATOR)

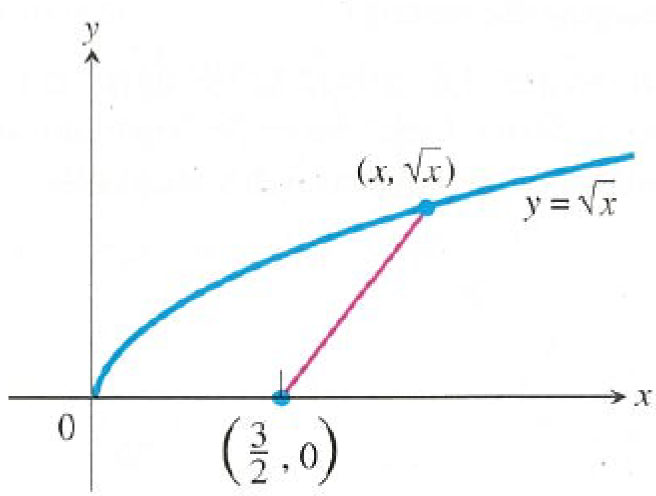
Largest Rectangle A rectangle has its base on the x-axis and its upper two vertices on the parabola $y = 12 - x^2$. What is the largest area the rectangle can have, and what are its dimensions?

6. Pg. 258 #54 (NO CALCULATOR)

Designing an Athletic Field An athletic field is to be built in the shape of a rectangle x units long capped by semicircular regions of radius r at the two ends. The field is to be bounded by a 400-m running track. What values of x and r will give the rectangle the largest possible area?

7. Pg. 229 #41 (NO CALCULATOR)

Calculus and Geometry How close does the curve $y = \sqrt{x}$ come to the point $(3/2, 0)$? [*Hint:* If you minimize the *square* of the distance, you can avoid square roots.]



8. Pg. 258 #52 (YES CALCULATOR)

Inscribing a Rectangle A rectangle is inscribed under one arch of $y = 8\cos(0.3x)$ with its base on the x-axis and its upper two vertices on the curve symmetric about the y-axis. What is the largest area the rectangle can have?

MEAN VALUE THEOREM

9. NO – CALCULATOR

Let $f(x) = \begin{cases} (x+2)^2 - 2 & x < 1 \\ 6x+1 & x \geq 1 \end{cases}$ on the interval $\left[-6, \frac{13}{6}\right]$

Assuming that f satisfies the hypothesis of the mean value theorem (which it does)...
Find the value(s) of c that satisfies the conclusion of the Mean Value Theorem.
(Show Work and no decimal answers)

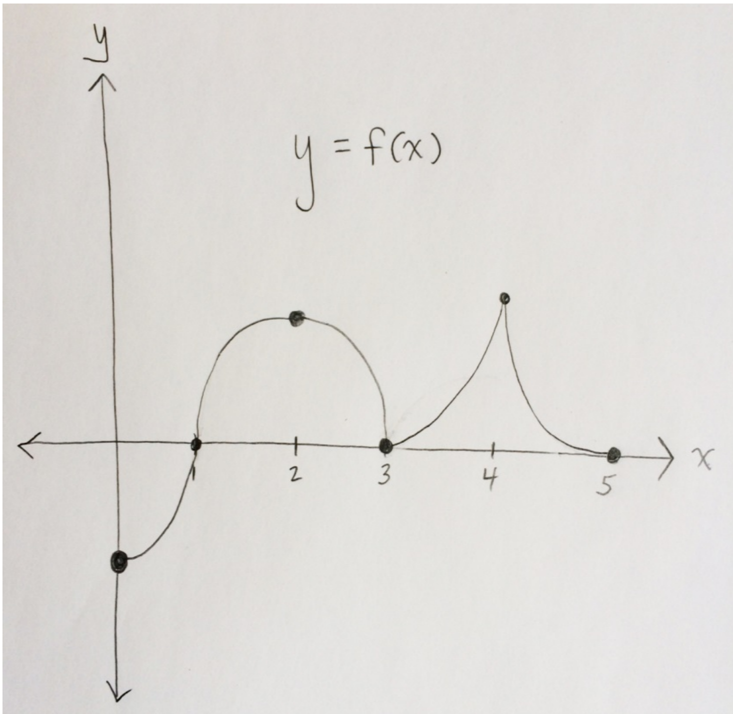
10. CALCULATOR – REQUIRED

Let $f(x) = \tan^{-1}\left(e^{x+2}\right) + \sin\left(x^2\right)$ on the interval $[-2, 1]$

Assuming that f satisfies the hypothesis of the mean value theorem (which it does)...
Find the value(s) of c that satisfies the conclusion of the Mean Value Theorem.
(Round to three decimal places)

GRAPH THEORY

11. Below is Steven's graph of $y = f(x)$.



THE CHART REPRESENTS STEVEN'S GRAPH

x	0	$0 < x < 1$	1	$1 < x < 2$	2	$2 < x < 3$	3	$3 < x < 4$	4	$4 < x < 5$	5
$f(x)$									**+**		
$f'(x)$			**DNE**								
$f''(x)$											

FILL IN EACH BLANK IN THE CHART ABOVE WITH ONE OF THE FOLLOWING:

+ for positive

– for negative

0 for zero

DNE for Does not Exist