**West Coast Collaborative**

Mathematics Specialist Unit 4

Test 4 2018: Calculus

**Student Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section One – calculator-free section**

**Time allowed for this task:** 30 minutes, in class, under test conditions

**Materials Provided:** SCSA Formula Sheet

**Materials required:** (to be provided by the student)

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters.

All electronic devices switched off and in bags.

**Marks available:** 31 marks

**1. [2, 3, 4, 4 = 13 marks]**

Determine the following definite integrals; using a judicious substitution, if necessary.

2. using the substitution,
3. d using the substitution, = 4 tan u
4. d

**2. [4, 5, 5 = 14 marks]**

Evaluate

(a) using the trig substitution x = 3 sin θ

(b) using the substitution u =

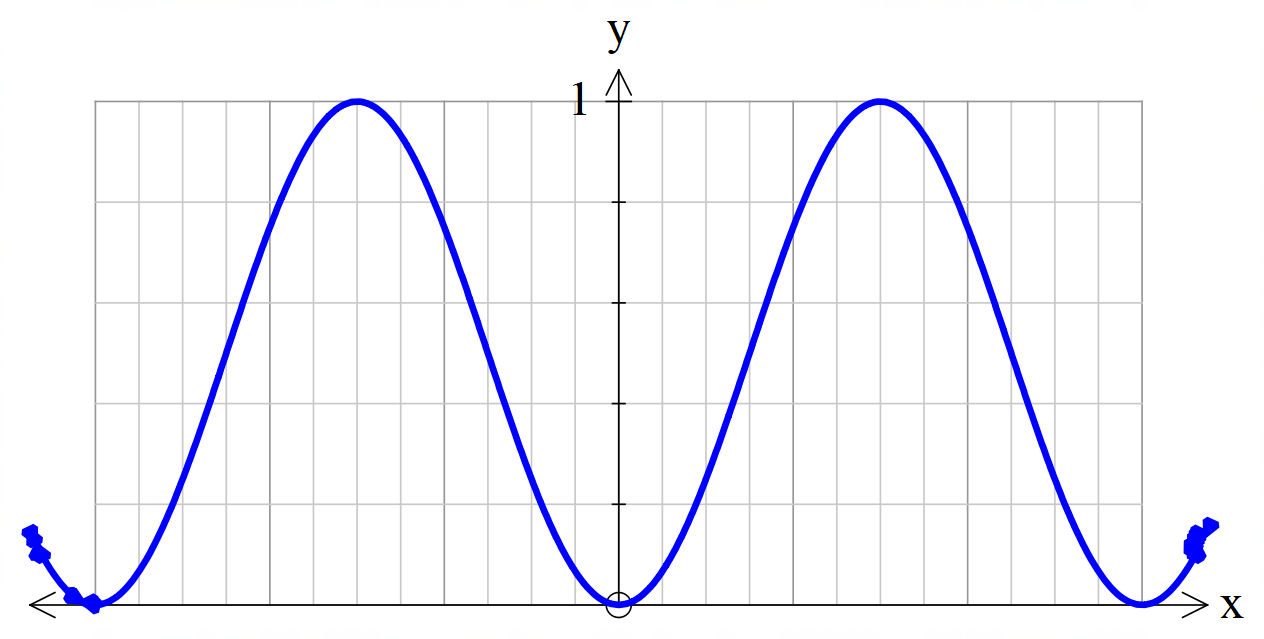
(c)

**3. [4 marks]**

The graph below shows the function . Determine the area of the region trapped between

the function , the lines , and





**End of Section One**

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You may use this space to extend or re-attempt an answer to a question or questions and should you do so then number the question(s) attempted and cross out any previous unwanted working.

**West Coast Collaborative**

Mathematics Specialist Unit 4

Test 4: Calculus

**Student Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section Two – calculator-assumed section**

**Time allowed for this task:** 25 minutes, in class, under test conditions

**Materials Provided:** SCSA Formula Sheet

**Materials required:** (to be provided by the student)

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters.

Notes on one unfolded sheet of A4 paper.

Special items: Drawing instruments, templates, and up to three calculators approved for use in WACE examinations.

All other electronic devices must be switched off and stored in bags.

**Marks available:** 23 marks

**4.** **[4, 4 = 8 marks]**

For the curves with equations

3y2 = 16x and y2 = 64 - 16x,

determine:

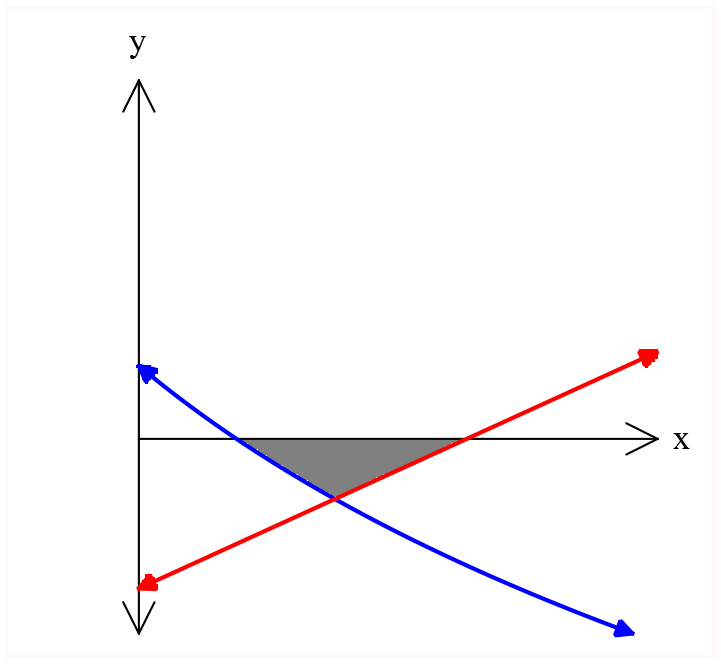
(a) the area of the region enclosed between the two curves,

{b) the volume of the solid of revolution about the x-axis formed by this region

**5. [6 marks]**

Below is shown the cross-section of a river (see shaded), the bed of which is described by curves; f(x) = –10ln( + 0.8) and g() = 2.5 – 10, where and y are in metres. If Karan is located at P, gazing into the river, contemplating the meaning of life, and the river current is 2m/s then how many kilolitres (to the nearest kL) of water will pass him by in five minutes of his thinking?

Note: 1 m3 = 1kL



(a, b)

Q

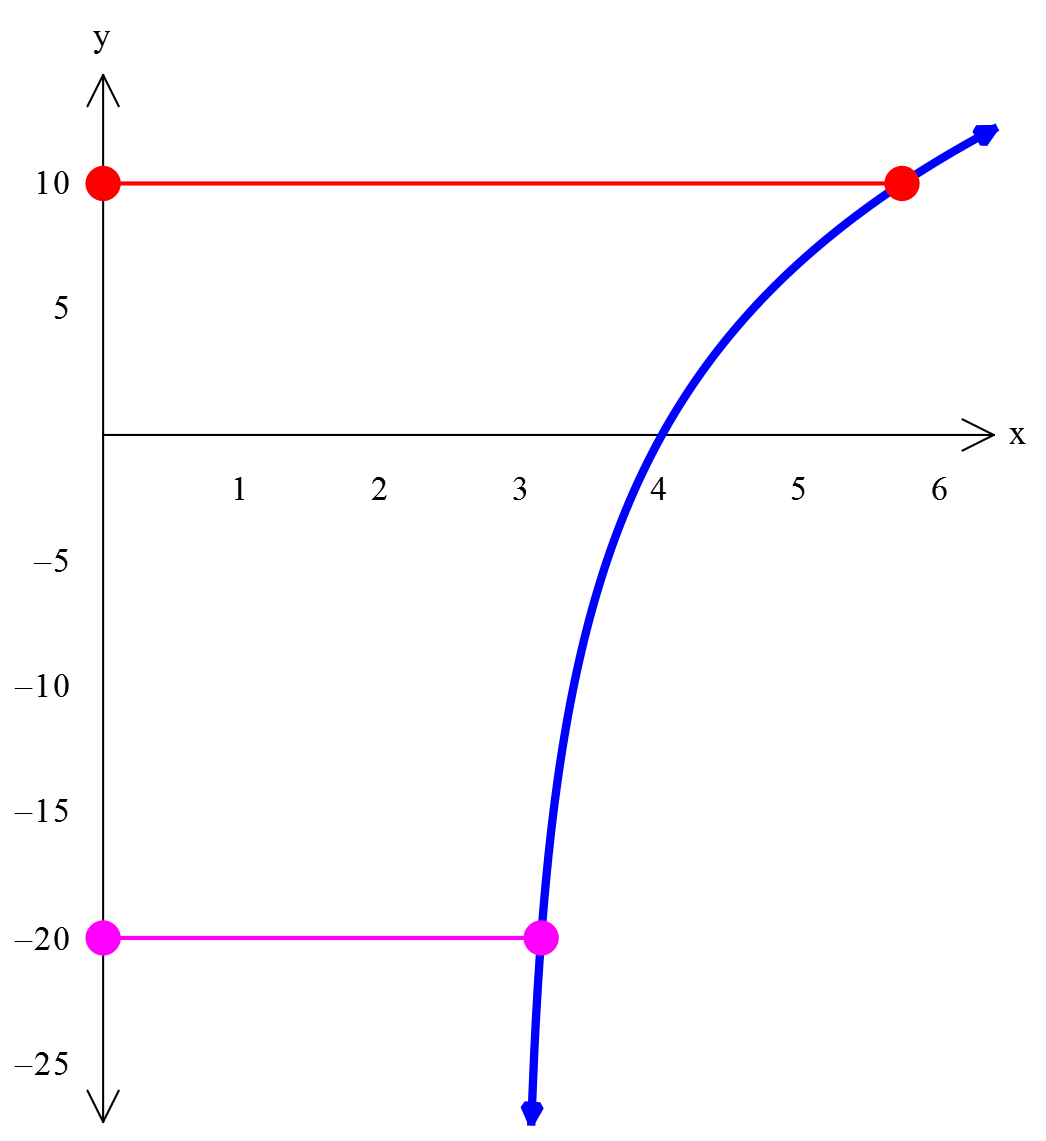
P

*y*

**6. [3 marks]**

Below is shown the graph of the curve of y = 10ln(x–3) where both x and y are in centimetres.

A vase is to be created by rotating the curve about the y-axis from y = -20 to y = 10



Determine the *volume* of the vase, correct to the nearest cm3.

**7. [6 marks]**

The region define by  for  is rotated about theaxis to generate and then rotated about the y axis to generate 

Prove that 

**End of Section Two**

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You may use this space to extend or re-attempt an answer to a question or questions and should you do so then number the question(s) attempted and cross out any previous unwanted working.