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Student Number

**ST PIUS X COLLEGE**
**CHATSWOOD**

# HSC 2019 Stage 6
# Year 12

## ASSESSMENT TASK #1

**20% of School Based Assessment**

# MATHEMATICS

**General Instructions**

- Working time – 45 minutes
- Write using black or blue pen
  Black pen is preferred
- Draw diagrams using pencil
- NESA approved calculators may be used
- Marks maybe deducted for careless or poorly arranged work
- Show all relevant mathematical reasoning and/or calculations
- Write your Student Number at the top of all booklets

**Total Marks – 35**

**Section I – Multiple Choice**

- Attempt Questions 1 – 5
- Use multiple choice answer sheet

**Section II**

- Attempt questions 6 – 8
- ***Start each question in a SEPARATE booklet***

| **Tick the class you are in:** | |
|---|---|
| **Mr Kennedy** | |
| **Ms Collings** | |
| **Mr Garvey** | |
| **Mr Steinman** | |

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**SECTION I – MULTIPLE CHOICE** *Use multiple choice answer sheet*

**Question 1**

Which of the following describes the locus of points that move so they are the same distance from a fixed point?

A A straight line through the point

B A pair of parallel lines

C A circle

D A parabola

**Question 2**

At a particular point on a curve, $f'(x) = 0$ and to the left of the point $f''(x) > 0$ while to the right of the point $f''(x) < 0$

The point must be

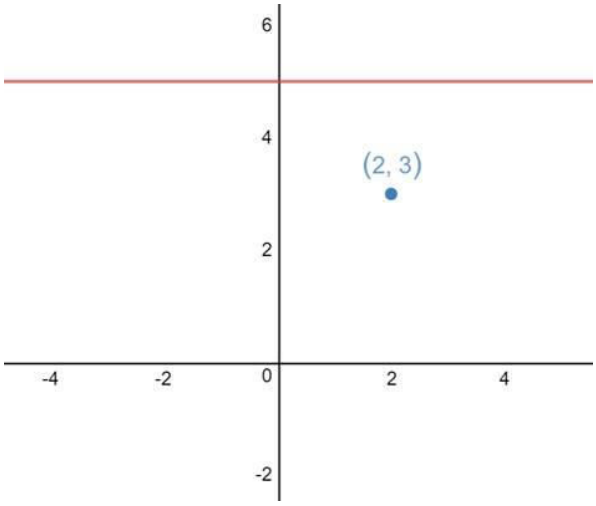
A A horizontal point of inflexion

B A minimum

C A maximum

D There is insufficient information

**Question 3**




From the diagram above, the locus of points whose distance from the point (2, 3) equals their perpendicular distance from $y = 5$, is given by the equation:

A $4(y-4) = (x-2)^2$

B $-4(y-4) = (x-2)^2$

C $(x-3)^2 = -4(y-3)$

D $(y-3)^2 = -4(x-3)$

**Question 4**

A is the point (3, 5) while B is the point (1, 2)

Which equation correctly represents P, which is twice as far from A as it is from B?

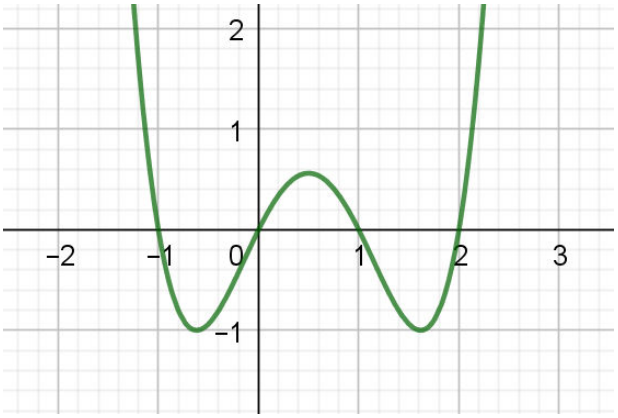
A $(x-3)^2+(y-5)^2=2((x-1)^2+(y-2)^2)$

B $(x-3)^2+(y-5)^2=4((x-1)^2+(y-2)^2)$

C $2((x-3)^2+(y-5)^2)=(x-1)^2+(y-2)^2$

D $4((x-3)^2+(y-5)^2)=(x-1)^2+(y-2)^2$

**Question 5**




The diagram represents the graph of $y=f(x)$. Which formulation will calculate the area between the curve and the $x$-axis?

A $\int_{-1}^{2} f(x)dx$

B $\int_{-1}^{0} f(x)dx+\int_{0}^{1} f(x)dx+\int_{1}^{2} f(x)dx$

C $-\int_{-1}^{0} f(x)dx+\int_{0}^{1} f(x)dx-\int_{1}^{2} f(x)dx$

D $\int_{-1}^{0} f(x)dx-\int_{0}^{1} f(x)dx-\int_{1}^{2} f(x)dx$

**End of Section I**

**SECTION II**

**QUESTION 6** *Start this question in a SEPARATE booklet* **Marks**

(a) Consider the points M(-3, 5) and N(1, 3).

(i) Find the midpoint of NM **1**

(ii) Find the gradient of MN **1**

(iii) P (*x, y*) moves so that it equidistant from M and N **2**

Find the locus of P

(iv) Describe this locus in relation to the interval MN. **1**

(b) The equation: $y^2 - 6y = -8x - 1$ is a parabola.

(i) By completing the square, rewrite the equation in the form **1**

$(y - k)^2 = -4a(x - h)$

(ii) What is the vertex and the value of a? **2**

(iii) Draw a sketch of the parabola showing the vertex, directrix **2**

and focus. You must label the important features listed above.

**QUESTION 7** *Start this question in a SEPARATE booklet* **Marks**

(a) Consider the quartic function $y = \frac{x^4}{4} + \frac{x^3}{3} - \frac{x^2}{2} - x$

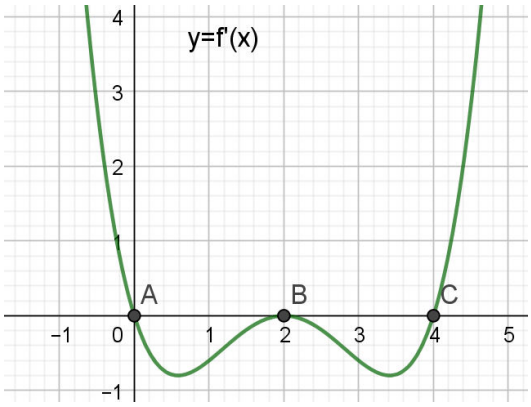
(i) What is the $y$-intercept? **1**

(ii) Show that stationary points occur at $x = -1$ and $x = 1$. **2**

(iii) Find the coordinates of the stationary points and determine their nature. **2**

(iv) Graph the curve, clearly showing the nature of the stationary points. **2**

(b) The graph shown below is of the first derivative $y = f'(x)$.




A, B and C represent stationary points for $y = f(x)$

State the nature of each stationary point. **3**

Use a diagram to assist you.

**QUESTION 8** *Start this question in a SEPARATE booklet* **Marks**

(a) Find

(i) $\int 2x-1.dx$ **1**

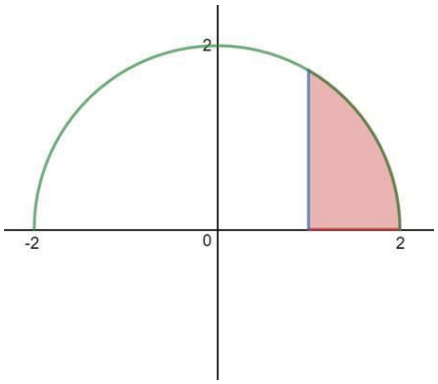
(ii) $\int_1^4 3x^2 - x^{\frac{1}{2}}.dx$ **2**

(b) Consider the cubic function $y = x^3 - 4x$

(i) Show that the curve intersects with the $x$ axis when $x = 2$ **1**

(ii) Find the area enclosed by the curve, the $x$ axis, $x = 1$ and $x = 3$ **3**

(c) The shaded region in the diagram below is the area underneath the curve $y = \sqrt{4-x^2}$ between $x = 1$, $x = 2$ and the $x$-axis.




Find the **exact** volume generated when this shaded region is rotated around the $x$-axis. **3**

**End of Assessment ☺**