Test 2
Area Under Curve, F.T.O.C. Exponential Functions
Semester One 2018
Year 12 Mathematics Methods
Calculator Assumed

PERTH MODERN SCHOOL
Exceptional schooling. Exceptional students.

Name:

Teacher:

_____ Mr McClelland

_____ Mrs. Carter

_____ Mr Gannon

_____ Ms Cheng

_____ Mr Staffe

_____ Mr Strain

Date: Friday 16th March 7.45am

You may have a formula sheet for this section of the test.

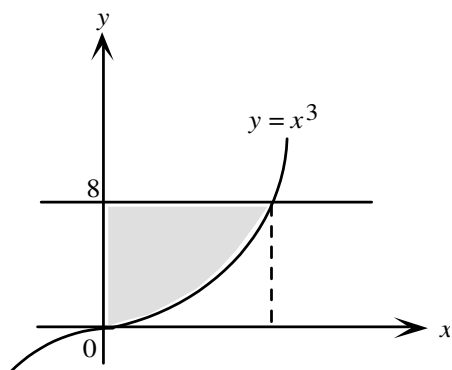Total_____/40   45 minutes +5 minutes READING

Question 1   **(2 marks)**

The graphs with equations $y = x^3$ and $y = 8$ are shown. Write an expression that shows what the area of the shaded region is equal to:

Question 2 **(5 marks)**

(a)   Calculate $f'(0)$ when $f(x)=e^{2x}(1+5x)^3$.   (3 marks)

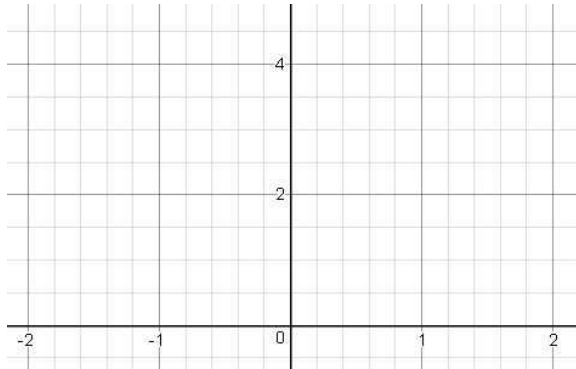(b)   Determine $\dfrac{d}{dx}\displaystyle\int_x^5 \sqrt{t^2+1}\,dt$.   (2 marks)

Perth Modern School

Question 3 **(4 marks)**

Show how to calculate the area of the region enclosed by the curves with equations $y=x^2+1$ and $y=4-x^2$ and the lines $x=-1$ and $x=1$.

Draw a sketch to help show your solution. Show your working.

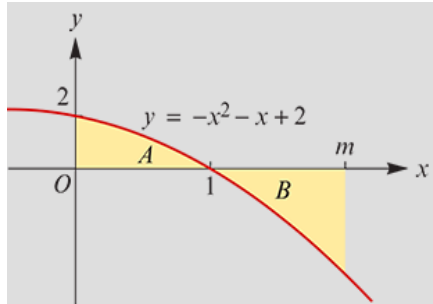Perth Modern School

Question 4   **(4 marks)**

The graph of $y=-x^2-x+2$ shown

Find the value of m such that A and B have the same area.

Question 5   **(4 marks)**

Given $\dfrac{dy}{dx}=ae^{-x}+2$ and that when $x=0$, $\dfrac{dy}{dx}=5$ and $y=1$,

Find the value of y when $x=2$.

Perth Modern School

Question 6   **(8 marks)**

A group of biologists has decided that colonies of a native Australian animal are in danger if their populations are less than 1000. One such colony had a population of 2300at the start of 2011. The population was growing continuously such that $P = P_0 e^{0.065t}$ where P is the number of animals in the colony t years after the start of 2011.

(a)   Determine, to the nearest 10 animals, the population of the colony at the start of 2014.

(2 marks)

(b)   Determine the rate of change of the colony's population when $t = 2.5$years.   (2 marks)

(c)   At the beginning of 2017, a disease caused the colony's population to decrease continuously at the rate of $8.25\%$of the population per year. If this rate continues, when will the colony become "in danger"? Give your answer to the nearest month.   (4 marks)

Question 7 (9 marks)

(a) What is the sign of $f(x)=x^3-6x^2+12x-8$ from $x=0$ to $x=2$? (1 mark)

(b) What is the sign of $f(x)=x^3-6x^2+12x-8$ from $x=2$ to $x=4$? (1 mark)

(c) Find $\int_0^4 (x^3-6x^2+12x-8)dx.$ (2 mark)

(d) Find $\int_0^2 (x^3-6x^2+12x-8)dx.$ (2 mark)

(e) What is the area between $f(x)=x^3-6x^2+12x-8$ and the $x-$ axis from $x=0$ to $x=4$?

(2 marks)

(f) Explain why the answers to (c) and (e) are different. (1 mark)

Perth Modern School

Question 8 **(4 marks)**

The population of mice in a closed habitat is known to increase according to the function:

$P'(t) = \dfrac{t}{3} + 6$, where $P'(t)$ is measured in hundreds of mice per month and t is measured in months. The measurement of the population commences at $t = 0$,

(a)   What is the total change in the population in the first 3 months after measuring commenced?

(2 marks)

(b)   How long will it take for the increase in the population of mice to reach 4200?   (2 marks)

Perth Modern School

Perth Modern School