PERTH MODERN SCHOOL
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Independent Public School

Course ___Methods_Test 2_ Year __12________

Student name: ______________ Teacher name: ______________

Date: 30 March

Task type: **Response**

Time allowed for this task: _____45______ mins

Number of questions: _____8______

Materials required: Calculator with CAS capability (to be provided by the student)

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

Special items: Drawing instruments, templates, notes on one unfolded sheet of A4 paper, and up to three calculators approved for use in the WACE examinations

Marks available: __46____ marks

Task weighting: __10__%

Formula sheet provided: Yes

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (3.2.1-3.2.3) (3 & 3 = 6 marks)

Determine y in terms of x for the following.

a) $\frac{dy}{dx} = 5x^3 - \frac{2}{x^2}$ given that $y = 10$ when $x = 2$.

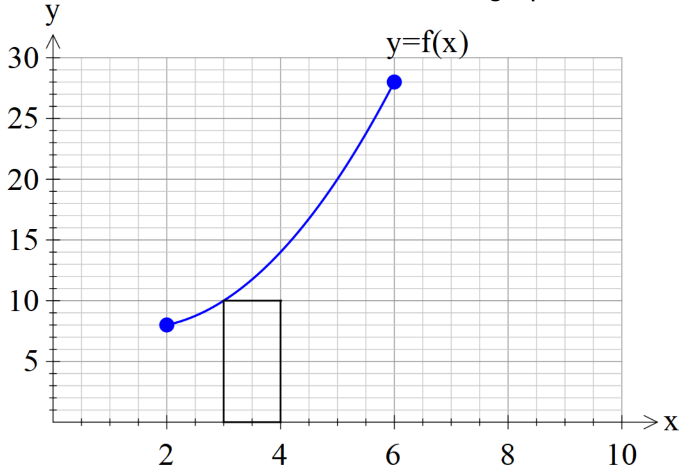
b) $\frac{dy}{dx} = \frac{50x^2}{(5 - x^3)^5}$ given that $y = 100$ when $x = 2$.

Q2 (3.2.21-3.2.22) (4 marks)

A particle travels along a straight line such that its acceleration at time t seconds is equal to $(5t - 1)m/s^2$. When $t = 1$the displacement is 22 metres and when $t = 3$the displacement is -10 metres. Determine the displacement when $t = 6$.

Q3 (3.2.10-3.2.11) (2. 2, 1 & 2 = 7 marks)

Consider the function $f(x)$ which is graphed for $2 \le x \le 6$.



a) By using rectangles of width one unit, as shown above, determine a lower estimate for the area under $f(x)$ for $2 \le x \le 6$.

b) By using rectangles of width one unit, as shown above, determine an upper estimate for the area under $f(x)$ for $2 \le x \le 6$.

c) Determine a better approximation for the area under $f(x)$ for $2 \le x \le 6$.

d) Describe two different methods to improve the approximation for the area under $f(x)$ for $2 \le x \le 6$.

Q4 (3.2.18-3.2.17) (3 & 2 = 5 marks)

An oil tank is drained of oil such that if $V\ kL$ of oil in the tank t seconds after draining commences is described by $\frac{dV}{dt} = 230 - \frac{120}{(t+3)^4}$.
The initially full tank is emptied in 2 mins.

a) How much oil was in the full tank? (nearest kL)

b) How much oil was drained from the tank in the fifth second, nearest kL.

Q5 (3.2.11-3.2.14) (2, 2 & 2 = 6 marks)

Consider a function $f(x)$ which is only defined for $-5 \le x \le 7$ with

$f(-5) = 0 = f(0) = f(7)$

$f(-4) = 8$

$f(-1) = 11$

$\int_{-5}^{0} f(x)dx = 22$

$\int_{-5}^{7} f(x)dx = -43$

It is known that $f(x) \ge 0$ for $-5 \le x \le 0$ and $f(x) \le 0$ for $0 < x \le 7$.
Determine.

a) $\int_{-4}^{-1} f'(x)dx$

b) $\int_{0}^{7} f(x)dx$

c) The area between $y = f(x)$ and the x axes for $-5 \le x \le 7$.

Q6 (3.2.20) (4 marks)

Determine to two decimal places the area between the curves $y = x^3 + x + 1$ and $y = 4x$.
(Hint- Sketch the curves first on your classpad)

Q7 (3.2.16) (2 & 2 = 4 marks)

Consider $y = \int_0^x t^3 + 3\left(1 + 4e^{2t}\right)^5 dt$

Determine.

a) $\dfrac{dy}{dx}$

b) $\dfrac{d^2y}{dx^2}$

Q8 (3.1.4) (4 marks)
The instantaneous rate of decline in the number of kangaroos on a particular park is 30% of the population per year. If there were 12 050 kangaroos on the park 3 years ago, how many will be on the park in four years from now

Q9 (3.2.6) (2 & 4 =6 marks)

(a) Determine $\frac{d}{dx}\left(x(x+1)^{\frac{1}{3}}\right)$.

(b) Using your result from part (a) and **without using your classpad** determine $\int \frac{x}{3(x+1)^{\frac{2}{3}}}dx$.

Working out space

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