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|  | **YEAR 12 MATHEMATICS SPECIALIST**  **SEMESTER TWO 2017**  **TEST 3: Applications of Calculus** |

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Monday 15th August Time: 50 minutes Mark /45

Section 1 – Calculator free 25 marks

### [5 marks – 4 and 1]

The curve defined by the equations  for  generates the ellipse shown.

1. Show that 
2. What is the slope of this curve at the point where  ?

### [4 marks]

If  and , determine the rate of change of *x* when 

### [4 marks – 2 and 2]

 is an even function, symmetric about the y-axis, as shown.

1. Show clearly that 
2. Evaluate  and *B* so that 

### [5 marks – 3 and 2]

1. Calculate 
2. Describe, terms of the curves  and , the quantity represented by your calculation in part (a).

### [7 marks – 3, 1 and 3]

Determine each of the integrals given:

1.  where 
2. 
3. Use the substitution  to evaluate  in simplest exact form.

Section 2 – Calculator assumed 20 marks Name:

### [9 marks – 3, 2 and 4]

The equation of a curve in the plane is given by 

1. Derive an expression, in terms of *x* and *y*, for . Check on ClassPad.
2. Find the equation of the tangent at the point 
3. At which points on the curve is the tangent parallel to the *y* axis?

### [6 marks – 3, 2 and 1]

Compare the volumes generated when the ellipse with equation  is revolved about the *x* axis and then the *y* axis.

Briefly explain why the larger value is the greater.

### [5 marks]

#### David is flying a kite, which maintains a constant height of 26 m.

#### The string from David’s hand, 1 m above the ground, to the kite is taut (i.e. forms a straight line) and he is releasing this string at a rate of 1.2 m per second.

#### Describe the motion of the kite when the length of the string is 65 m.