



The Sharp EL-531 calculator may be used on this test.  
Show all of your work in the space provided.  
The number of marks for each question is indicated in brackets.  
Give exact answers (no decimals) unless told otherwise.

Mark:

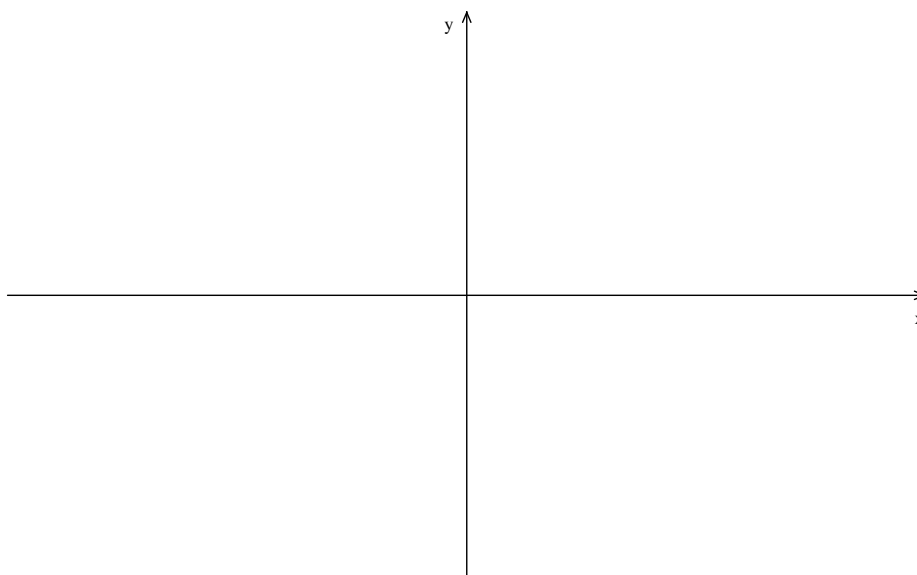
25

1. Evaluate  $\arctan 0.7$  and  $\tanh^{-1} 0.7$  using your calculator, rounding each to three decimal places.

[1]

2. Sketch the graph of  $y = \arccos x$ , clearly showing its domain, range, intercepts and asymptotes (if any).

[2]



3. Simplify:  $\ln(\cosh x - \sinh x)$

[2]

4. Differentiate and simplify your answer:  $y = \arcsin(\cos x)$ , where  $0 < x < \pi$

[2]

5. Integrate and simplify your answer:  $\int \frac{5 \sinh x}{\sqrt{\sinh^2 x + 1}} dx$

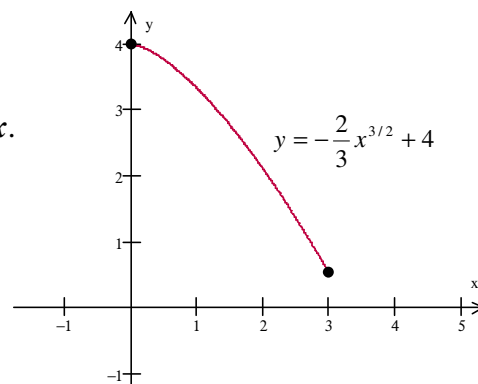
[3]

6. Evaluate:  $\int_{-4}^{-1} \frac{1}{x^2 + 8x + 25} dx$

[3]

7. Consider the curve shown to the right, where  $0 \leq x \leq 3$ .

(a) Find the arc length of the curve by integrating **with respect to  $x$** .



[3]

(b) Set up **but do not evaluate** a definite integral **with respect to  $x$** , representing the surface area of the surface formed by revolving the curve shown above about the  $y$ -axis.

[1]

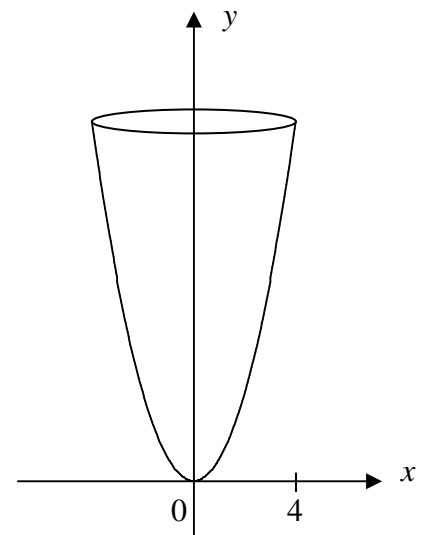
8. Consider the region in the plane bounded by the curves

$$y = \sqrt{x} \text{ and } y = x^2.$$

Set up **but do not evaluate** a definite integral representing the volume of the solid formed by revolving the region about the line  $y = 1$  using the **shell** method.

[4]

9. Consider a tank whose surface is formed by revolving the curve  $y = x^2$ , for  $0 \leq x \leq 4$ , about the  $y$ -axis (where  $x$  and  $y$  are measured in meters). If the tank is full of water having weight density  $\rho g = 9,800 \text{ N/m}^3$ , then how much work is required to pump all the water out over the top?



[4]