**Self-assessment answers: 20 Further applications of calculus**

**1. **



*[7 marks]*

**2. **



By chain rule, 

When *t* = 5 and *r* = 26,  = 113971 cm3 s−1*[5 marks]*

**3.** (a) *V* = π*r*2*h*, *A* = 2π*r*2 + 2π*rh*

⇒  as required.

(b) Minimum surface area when = 0,

⇒  = −1264*h*−2 +  = 0

⇒ *h* =  = 9.30 cm

⇒ *A* = 408 cm2*[6 marks]*

**4.** (a) *a* =  = 3e −2*t* cos *t* – 6e −2*t* sin *t* = 3e −2*t*(cos *t* – 2 sin *t*)

When at maximum velocity, *a* = 0 ⇒ tan *t* = 0.5 (on the first occasion, since the exponential means that it will never again reach that level).

⇒ *t* = 0.464 s

(b) *a*(3) = −0.00946 ms −2

(c) *v* is positive for 0 ≤ *t* ≤ π, so distance travelled equals displacement at *t* = 3.

distance == 0.601 m (GDC)

(d) Displacement *x*(*t*) = 

 (integration by parts)

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⇒  *[12 marks]*