BECA / Huson / 12.1 IB Math SL Name:
28 March 2019

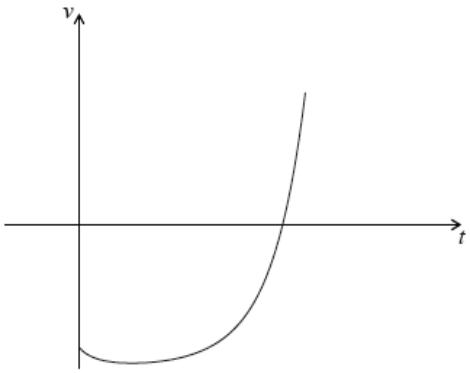
7-8 Homework: Calculus review

1. Let $f'(x) = 6x^2 - 5$. Given that $f(2) = -3$, find $f(x)$. *[6 marks]*

2a. The velocity v ms^{-1} of a particle after t seconds is given by

$v(t) = (0.3t + 0.1)^t - 4$, for $0 \leq t \leq 5$

The following diagram shows the graph of v.



Find the value of t when the particle is at rest.

[3 marks]

2b. Find the value of t when the acceleration of the particle is 0. *[3 marks]*

3. Let $f(x) = \frac{\ln(4x)}{x}$ for $0 < x \leq 5$.

Points $\text{P}(0.25,\ 0)$ and Q are on the curve of f. The tangent to the curve of f at P is perpendicular to the tangent at Q. Find the coordinates of Q. *[7 marks]*

4a. Let $f(x) = -x^4 + 2x^3 - 1$, for $0 \leq x \leq 2$.

Sketch the graph of f on the following grid. *[3 marks]*

4b. Solve $f(x) = 0$. *[2 marks]*

4c. The region enclosed by the graph of f and the x-axis is rotated 360° about the x-axis.

Find the volume of the solid formed. *[3 marks]*

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5a. Let $f(x) = \sqrt[3]{x^4} - \frac{1}{2}$.

Find $f'(x)$. *[2 marks]*

5b. Find $\int f(x)\mathrm{d}x$. *[4 marks]*

6a. *[4 marks]*

Consider $f(x) = x^2 \sin x$.

Find $f'(x)$.

6b. *[3 marks]*

Find the gradient of the curve of f at $x = \frac{\pi}{2}$.

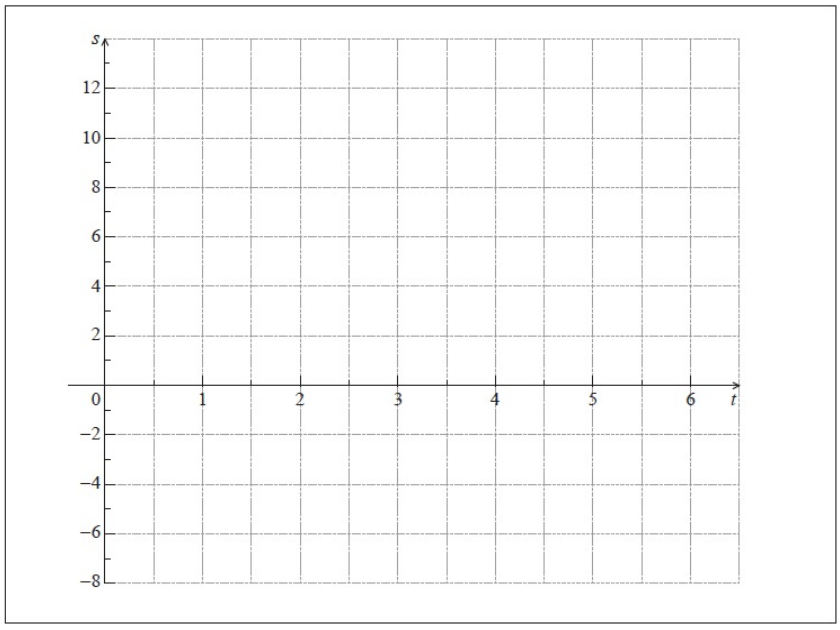
7. *[7 marks]*

A rocket moving in a straight line has velocity v km s^{-1} and displacement s km at time t seconds. The velocity v is given by $v(t) = 6\mathrm{e}^{2t} + t$. When $t = 0$, $s = 10$.

Find an expression for the displacement of the rocket in terms of t.

8a. A particle's displacement, in metres, is given by $s(t) = 2t\cos t$, for $0 \leq t \leq 6$, where *t* is the time in seconds.

On the grid below, sketch the graph of s. *[4 marks]*



8b. Find the maximum velocity of the particle. *[3 marks]*