# Differentiation 1 Marked Homework 6

[SQA] 1. Given $f(x) = 3x^2(2x-1)$, find $f'(-1)$. **3**

[SQA] 2. Find $f'(4)$ where $f(x) = \dfrac{x-1}{\sqrt{x}}$. **5**

[SQA] 3. If $f(x) = kx^3 + 5x - 1$ and $f'(1) = 14$, find the value of $k$. **3**

[SQA] 4. Find $\dfrac{dy}{dx}$ where $y = \dfrac{4}{x^2} + x\sqrt{x}$. **4**

[SQA] 5. Differentiate $2\sqrt{x}(x+2)$ with respect to $x$. **4**

[SQA] 6. Find the $x$-coordinate of each of the points on the curve $y = 2x^3 - 3x^2 - 12x + 20$ at which the tangent is parallel to the $x$-axis. **4**

[SQA] 7. The point $\mathrm{P}(-1, 7)$ lies on the curve with equation $y = 5x^2 + 2$. Find the equation of the tangent to the curve at P. **4**

[SQA] 8. Find the equation of the tangent to the curve $y = 4x^3 - 2$ at the point where $x = -1$. **4**

[SQA] 9. Find the equation of the tangent to the curve $y = 3x^2 + 2$ at the point where $x = 1$. **4**

[SQA] 10. A curve has equation $y = x - \dfrac{16}{\sqrt{x}}$, $x > 0$.

Find the equation of the tangent at the point where $x = 4$. **6**

[SQA] 11. Find the coordinates of the turning points of the curve with equation $y = x^3 - 3x^2 - 9x + 12$ and determine their nature. **8**

[SQA] 12. A curve has equation $y = 2x^3 + 3x^2 + 4x - 5$.

Prove that this curve has no stationary points. **5**

[SQA] 13. A ball is thrown vertically upwards.

After $t$ seconds its height is $h$ metres, where $h = 1{\cdot}2 + 19{\cdot}6t - 4{\cdot}9t^2$.

(*a*) Find the speed of the ball after 1 second. **3**

(*b*) For how many seconds is the ball travelling upwards? **2**

[SQA] 14. A ball is thrown vertically upwards. The height $h$ metres of the ball $t$ seconds after it is thrown, is given by the formula $h = 20t - 5t^2$.

(*a*) Find the speed of the ball when it is thrown (i.e. the rate of change of height with respect to time of the ball when it is thrown). **3**

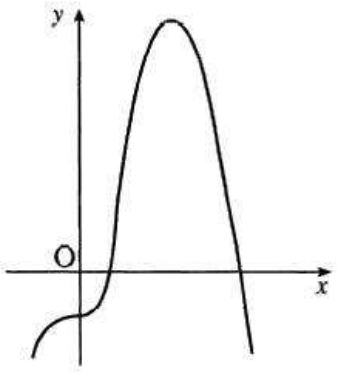
(*b*) Find the speed of the ball after 2 seconds.

Explain your answer in terms of the movement of the ball. **2**

[SQA] 15. **A curve has equation $y = -x^4 + 4x^3 - 2$. An incomplete sketch of the graph is shown in the diagram.**

**(*a*) Find the coordinates of the stationary points. (6)**

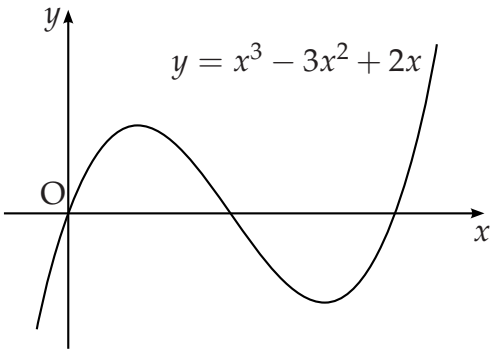
**(*b*) Determine the nature of the stationary points. (2)**




[SQA] 16. The diagram shows a sketch of the graph of $y = x^3 - 3x^2 + 2x$.

(*a*) Find the equation of the tangent to this curve at the point where $x = 1$. **5**

(*b*) The tangent at the point $(2, 0)$ has equation $y = 2x - 4$. Find the coordinates of the point where this tangent meets the curve again. **5**




*[END OF QUESTIONS]*