

Tutorials for end of Week 5 / beginning of Week 6

MATH1111: Introduction to Calculus

Semester 1, 2011

Web Page: <http://www.maths.usyd.edu.au/u/UG/JM/MATH1111/>

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1. The table below shows the distance, s (measured in kms), an aeroplane travels as a function of time, t (measured in hours), since takeoff:

t	0	1	2	3	4
s	0	740	1620	2480	3160

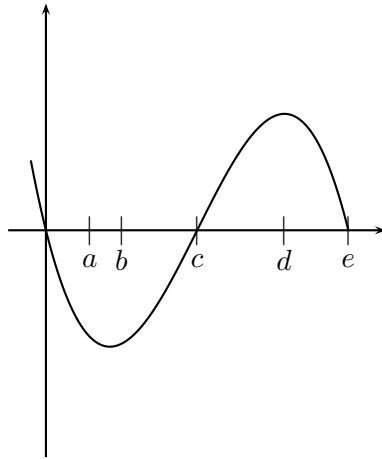
- (a) What is the average speed of the plane in the first four hours?
(b) What is the average speed of the plane between the first and third hours?
2. A particle's distance from its starting point, s , as a function of time, t , is given by the equation

$$s = 3t^2 + t.$$

- (a) Find the average velocity between $t = 1$ and $t = 1 + h$ where
(i) $h = 0.1$
(ii) $h = 0.01$
(iii) $h = 0.001$
(b) Estimate the instantaneous velocity of the particle at $t = 1$.
3. Evaluate each of the following limits:

- (a) $\lim_{h \rightarrow 0} \frac{2h - 4(h - h^2)}{4h}$.
(b) $\lim_{h \rightarrow 0} \frac{4(h - 3)^2 - (h - 6)^2}{h}$.

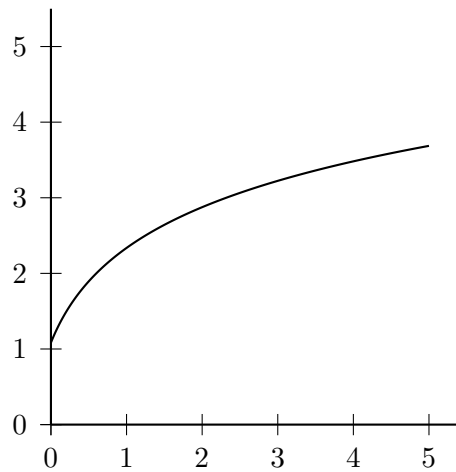
4. For the graph of the function $f(x)$ below:



Match the derivatives with the corresponding x -values in the following table:

x	$f'(x)$
	-4
	-2
	0
	0.5
	2

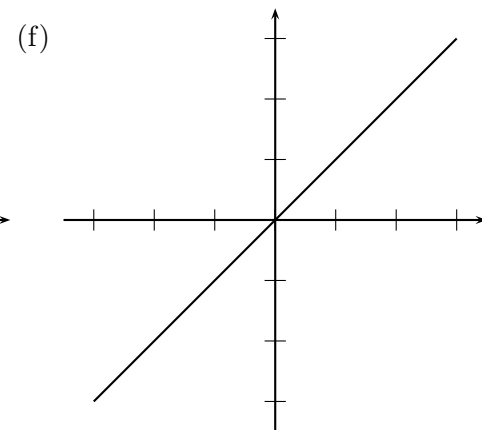
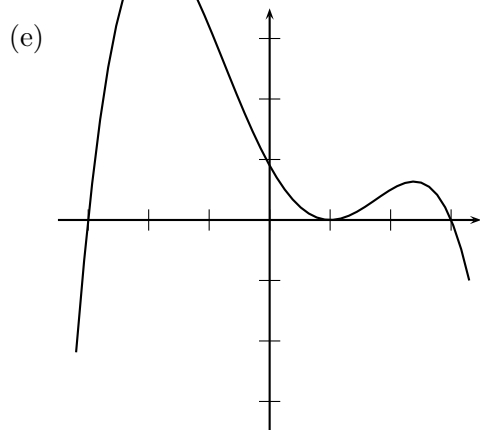
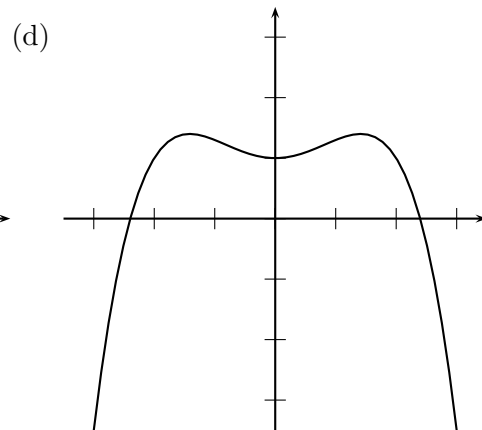
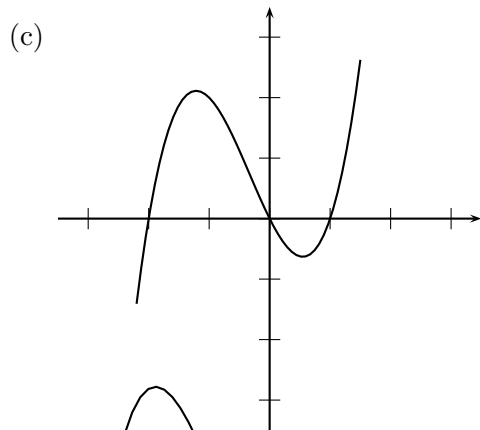
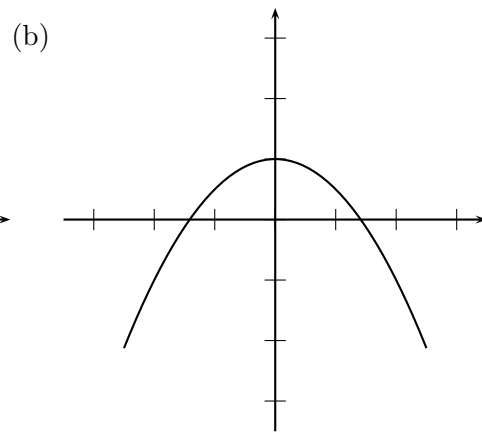
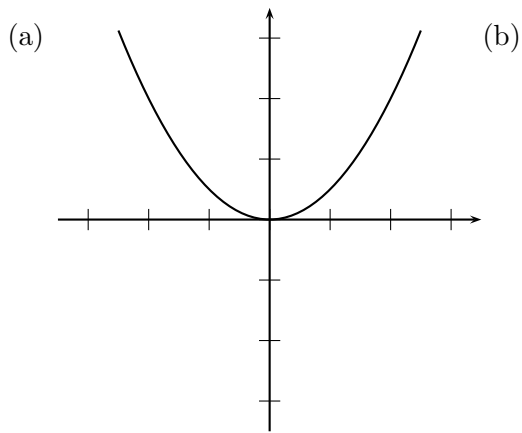
5. By analysing the graph of $g(x)$ below:



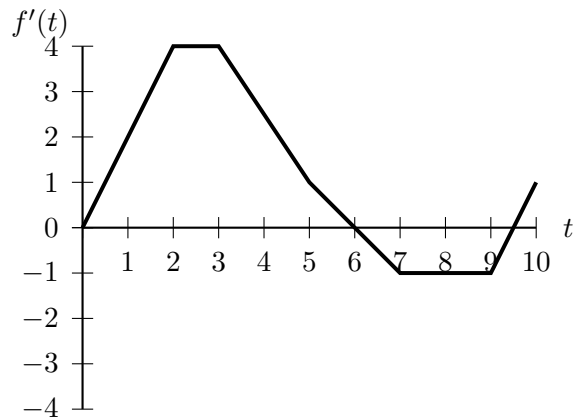
Approximate the following values:

- (a) $g(1)$
- (b) $g(4)$
- (c) $g'(1)$
- (d) The average rate of change between $x = 1$ and $x = 4$

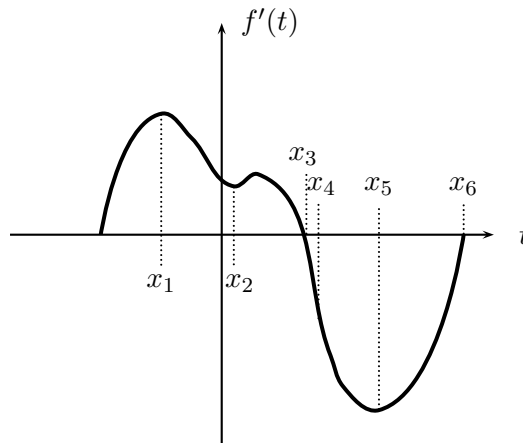
6. Each of the graphs below show a function of x . Sketch the derivative function on the same set of axes.



7. The following graph shows the speed of a robot $f'(t)$ moving along a straight track.



- (a) During what time interval(s) is the robot moving the fastest?
 (b) During what time interval(s) is the robot moving forwards?
 (c) During what time interval(s) is the robot moving backwards?
 (d) At what time(s) is the robot stationary?
8. China's population reached 1.3 billion people at the beginning of 2005, and has been growing at an average of 0.57% per annum since that time.
- (a) Define a function that expresses the population, P , as a function of time, t (measured in years since 2005).
 (b) Using this function, evaluate $P(5)$ and $P(5.1)$.
 (c) Using part (b), estimate $P'(5)$. Interpret your answer in practical terms.
9. Below is a graph of $f'(x)$ for some function $f(x)$.



Match the x_i for $i = 1, 2, \dots, 6$ with the following descriptors:

- (a) The point where $f'(x)$ takes its largest positive value
 (b) The point where $f'(x)$ takes its largest negative value
 (c) The point where $f(x)$ takes its largest positive value
 (d) The point where $f(x)$ takes its largest negative value
 (e) The point where $f''(x)$ takes its largest negative value
 (f) A point where $f''(x)$ is zero