

Tutorials for end of Week 2/ beginning of Week 3

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 following functions represent exponential growth or decay. For each function, state the initial quantity and the percentage growth or decay rate.

(a) $P = 3.2e^{0.03t}$

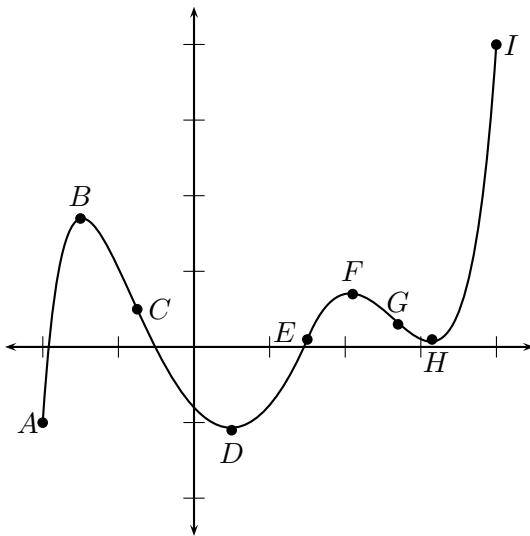
(b) $P = 15e^{-0.06t}$

(c) $P = 0.01e^t$

(d) $P = -2.4e^{-2t}$

2. Identify the x -intervals on which the function graphed below is:

- (a) Increasing and concave up
(b) Increasing and concave down
(c) Decreasing and concave up
(d) Decreasing and concave down



3. The growth rate in Australia in 2010 is 1.69% per annum, and the population is approximately 21,374,000.

- (a) Write a formula for the population of Australia as a function of years since 2010.
(b) Use this formula to estimate the population in 2050.
(c) Use this formula to estimate the population in 1900.

4. Let $f(t) = Q_0(1 + r)^t$, where Q_0 is the initial quantity, and r is the growth rate. Given that $f(0.02) = 25.02$ and $f(0.05) = 25.06$, find r .
5. Mount Everest's peak stands at 8,848m above sea level, and air pressure decays exponentially by 0.013% every meter you travel above sea level. By what percentage is the air pressure reduced by moving from sea level to the peak of Mount Everest?
6. Find the following:
- (i) $f(g(1))$,
 - (ii) $g(f(1))$,
 - (iii) $f(g(x))$,
 - (iv) $g(f(x))$,
 - (v) $f(x)g(x)$,
- for each pair of functions below:
- (a) $f(x) = x^2$, $g(x) = x - 2$,
 - (b) $f(x) = \sqrt{x} + 1$, $g(x) = x^2$,
 - (c) $f(x) = e^x$, $g(x) = x^3$,
 - (d) $f(x) = \frac{2}{x}$, $g(x) = x + 2$.
7. (a) Let $f(x)$ be the amount of money it costs to buy x litres of fuel for a car. Explain what $f^{-1}(50)$ means in practical terms.
- (b) Let f be as above, and let $g(y)$ be the average distance (in kms) a car travels with y litres of petrol in the tank. Explain what $f(g^{-1}(20))$ means in practical terms.
8. For each of the following functions, decide whether it is even, odd, or neither.
- (a) $f(x) = x^5 + x^3 + x$,
 - (b) $f(x) = x^3 + 1$,
 - (c) $f(x) = e^{x^2-2}$
9. For $g(x) = x^2 + 2x + 5$, find and simplify:
- (a) $g(2 + h)$,
 - (b) $g(2)$,
 - (c) $g(2 + h) - g(2)$.
10. A shipment of n shipping containers contains, on average, x boxes of electronics, where $x = 3n - 1$. Each box of electronics is worth, on average, $\$y$, where $y = 30x^2 - 20$. Find the average amount a shipment is worth as a function of the number of shipping containers per shipment.

11. Simplify the following:

(a) $6e^{\ln(B^2)}$,

(b) $\ln(e^{3AC})$,

(c) $2e^{\ln(2)+A}$,

(d) $(e^{\ln(B^2)})^2$,

(e) $\ln(2e^{AB})$,

(f) $2\ln(e^B) + 3\ln(B^e)$.