MATH3733, Exercises 1

1. It is possible to write call options on stock indices as well as individual stocks. The following dataset (quoted in [HWD], p. 8, and taken from the Financial Times on Feb. 4, 1993) gives the prices of various call and put options for the FT-SE index, which was valued at 2872 on that date. ("NA" stands for "not available;" that is, there is no option available at that price.)

	2650	2700	2750	2800	2850	2900	2950	3000
CALLS								
Feb	233	183	135	89	50	24	9	3
Mar	243	197	153	113	79	51	31	17
Apr	254	210	170	131	99	73	51	36
May	266	226	186	151	121	93	72	52
Jun	NA	235	NA	164	NA	107	NA	67
Dec	NA	NA	NA	235	NA	187	NA	130
PUTS								
Feb	$1\frac{1}{2}$	$2\frac{1}{2}$	$4\frac{1}{2}$	10	23	47	85	131
Mar	8	12	17	29	46	69	100	138
Apr	16	22	31	44	63	86	116	151
May	26	35	45	61	80	105	133	166
Jun	NA	40	NA	70	NA	113	NA	175
Dec	NA	90	NA	125	NA	185	NA	NA

(a) Identify the exercise prices and expiry dates listed in this table.
(b) Which exercise prices are in the money and which are out of the money?
(c) On graph paper, plot carefully the intrinsic value of the call option (i.e. $(S-K)_+$) vs. the exercise price. On the same graph, choose two expiry dates and plot the call option value vs the exercise price. For these 3 plots, comment on how the call option value varies with the exercise price and with the expiry date.
(d) Plot the profit arising from the purchase of an FT-SE May 2850 call, purchased on Feb 4, 1993, as a function of the FT-SE index value in May.

2. Would you expect the value of call and/or put options to increase or decrease with the uncertainty or volatility ($\approx$ variability) in the stock price? Why?

3. (Review of compound interest). Suppose a \$1000 bond is invested for one year at a fixed interest rate of 6%. (a) If the interest is added on just once, at the end of the year, show that the final value of the bond is $\$1000 \times 1.06$.
(b) If interest is added on twice during the year, show that the final value is $\$1000 \times 1.03 \times 1.03$.
(c) If interest is added on n times during the year, show that the final value tends to $\$1000 \times \exp(.06)$ as $n \to \infty$. This limiting case is known as *instantaneous compounding*.