Question 1.

(a) -The two samples correspond to a single sample of stocks and must be paired.
–the possible tests are matched t-test, Wilcoxon or sign tests.

(b) –since the data are matched, we must look at the boxplot of differences
–since there is an outlier in this boxplot, we cannot do the t-test since this requires the assumption of normally distributed differneces and must do a non-parametric test.

Note that if the answer in (a) claims the 2 samples are independent, then (b) should observe that the first two boxplots are consistent with samples from normal populations, in which case the most appropriate test is the 2 independent samples t-test. Here there are no marks for (a), but full marks for (b).

(c) –H0: population mean difference = 0, HA: mean < 0
-t = -4.14/(5.4/sqrt(21)) = 4.14/1.179 = -3.51
-reject the H0 if t < -2.528 (df = 20, one-sided alpha=.01)
-since t=-3.51 < critical value, we reject H0 and conclude the average stock price has increased.

It is possible to give full marks for a 2-sample t-test if the answer to (a) was that the samples were independent. In this case, t is -.69, assuming unequal variances and df = 38, in which case the t-critical is -2.43; the decision is not to reject the null H and the conclusion is that stock prices have not increased.

(d) t = (-4.14 – (-2))/ 1.179 = -2.14 / 1.179 = 1.815
We reject the H0 that average difference = -2 and conclude average difference is < -2 or that the average stock price has increased by more than $2.

(e) .5 for each answer:
size **20** , **less than or equal to 2** , **binomial** probability , **p = .5**

Question 2.

(a) n=1.96^2*0.5*0.5/0.02^2=2401 or use pilot sample
1.96^2*(52/72)*(1-52/72)/0.02^2=1927

(b) H0: $\pi_1 \leq 0.5$
HA: $\pi_1 > 0.5$

Z = (52/72-0.5)/sqrt(0.5*(1-0.5)/72)=3.77

CI: 52/72 +/- 1.96 * sqrt (.5*.5 / 72) =

Since 3.77>1.645 or the CI does not contain the value .5, reject H0 and conclude that more people prefer to invest in past winners

(c) H0: $\pi_1 = \pi_2$
HA: $\pi_1 \neq \pi_2$

p_1=20/25=0.8
p_2=14/23=0.6087
p_{pooled}=(20+14)/(25+23)=0.7083

z=(0.8-0.6087)/sqrt(0.7083*(1-0.7083)*(1/25+1/23))=1.4566

Since |1.4566|<1.96, do not reject H0 and may assume that the probability to invest in past winner is the same for School of Management and Economics students

(d) Use Contingency analysis test and test hypothesis that "buying decision" is independent on "major"

Find expected frequencies:

	Invest in past winners	Invest in past losers	TOTAL
School of Management students	20 25*52/72=18.056	5 25*20/52=6.944	25
Economics students	14 23*52/72=16.61	9 23*20/72=6.389	23
Other students	18 24*52/72=17.333	6 24*20/72=6.667	24
TOTAL	52	20	72

Find chi-sq = (20-18.056)^2/18.056+(5-6.944)^2/6.944+(14-16.61)^2/16.61+

+(9-6.389)^2/6.389+(18-17.333)^2/17.333+(6-6.667)^2/6.667=2.323

d.f. = (3-1)*(2-1)=2
Chi-sq(5%, 2d.f.)=5.99

Since 2.323<5.99, we cannot reject H0, so, we can assume that the probability to invest in past winner is the same for all majors

(e) Goodness of fit test

H0: π_1=0.5
π_2=0.25
π_3=0.25

Find observed and expected frequencies

	observed	probability	expected
SoM	25	0.5	36
Econ	23	0.25	18
Other	24	0.25	18
Total	72		

Find chi-sq:

Chi-sq=(25-36)^2/36+(23-18)^2/18+(24-18)^2/18=6.75

d.f.=3-1=2

Chi-sq(5%, 2d.f.)=5.99

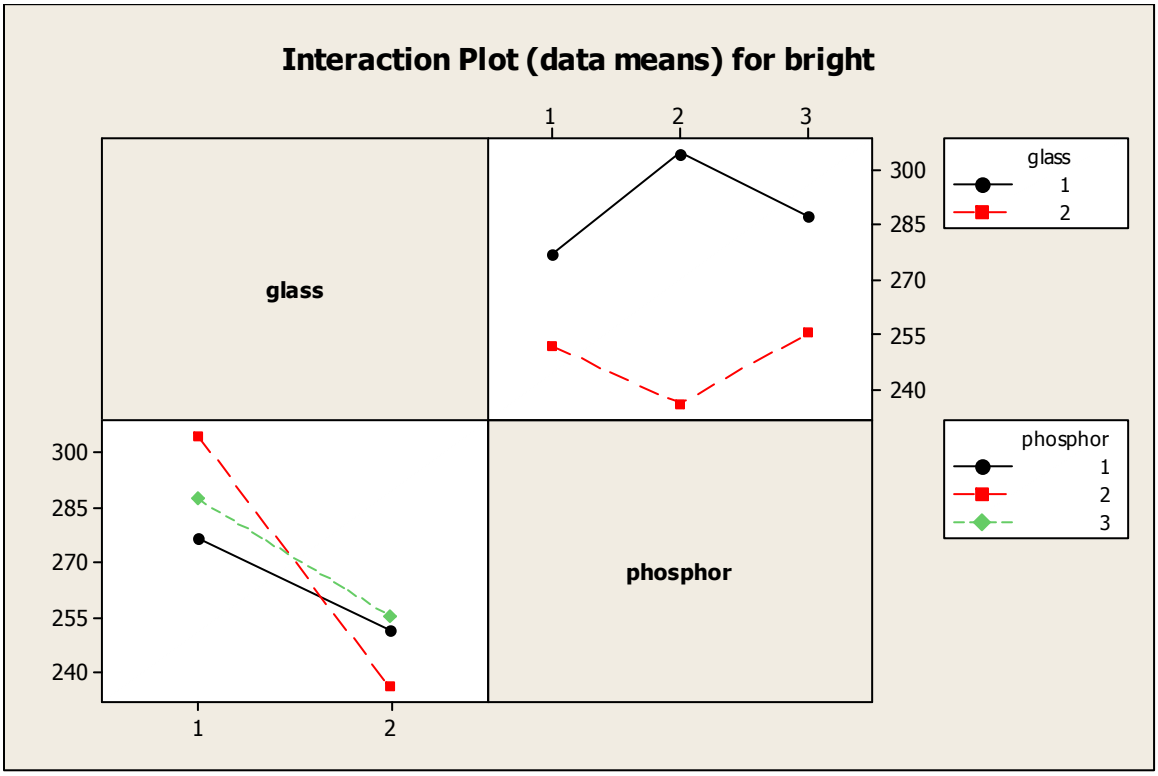
Since 6.75>5.99, we reject H0, so, we can conclude that it is not true that that 50% of all University of Ottawa students are enrolled at the School of Management and, at the same time, half of the remaining students have Economics major

Question 3.

Solution is obvious (with the exception of (3) where students need to say that the margin of error for PI will be at leas 2*S>2) and is based on the following complete Minitab outputs:

Question 4.

(a) Interactions Plot
1 mark for labelling the axes properly with phosphor type on the x-axis, and brightness on the y-axis,
1 mark for the plotting the cell means properly,
1 mark for drawing the line segments,
1 mark for labelling the line segments by the glass type



(b)
-There appears to be interaction since the line segments are not parallel.
-The upper right plot appears to show that glass type 1 appears to result in brighter monitors than glass type 2.

(c)
The director of research and development has received anecdotal evidence that the type of glass does not affect the brightness of the monitor as long as phosphor type 2 is used, and that the type of glass does make a difference if two other phosphor types are used.

-The interactions plot appears to contradict the first statement and confirm the second.
-In fact, the type of glass appears to make a difference for all three phosphor types--these differences being the same for phosphor types 1 and 3, and actually greater for phosphor type 2.

(d) any reasonable comment is fine—expect people to say that the residuals appear to be normally distributed and no problem with constant variance assumption

(e)
-H0: no interaction, HA: some interaction
-F = MSint / MSE = 3.46, compared to critical value of 3.89 (2,12 df);
-Do not reject null H, Conclude there is no interaction.
-The appearance of interaction in the plot could be due to experimental error, OR
There is interaction, but we cannot confirm it because of error.

(e)

```
glass     Mean  --+---------+---------+---------+-------
1      289.556                      (-----*----)
2      247.667  (-----*----)
                --+---------+---------+---------+-------
                240       260       280       300
```

The difference in means is 289.556 - 247.667, and the t-value is 2.179, based on 12 df.
-The standard error is 15.44 * sqrt(1/9 + 1/9) = 7.28
-The CI is 42 +/- 2.179 * 7.28, or 42 +/- 15.9 or (26, 58)
-Since the CI does not include zero, we conclude that there is a glass type effect on brightness (this is consistent with the F-statistic of 7896/238 = 33, which is very large)