

1. Find the value of a \$1 investment after one year with an annual interest rate of 100% compounded... (refer to p. 305-7 in your text if necessary)

- a) annually                      b) quarterly                      c) monthly
- d) daily                              e) continuously

2. a) Write  ${}_nP_5$  in terms of n.

b) Write  ${}_nC_5$  in terms of n.

3. Analyze the following limits:

a)  $\lim_{n \rightarrow \infty} \frac{n^2 - 1}{n^2 + 1}$                       b)  $\lim_{n \rightarrow \infty} \frac{n - 3n^3}{n^4}$                       c)  $\lim_{n \rightarrow \infty} \frac{n^2 + 1200}{3 - 17n^2}$                       d)  $\lim_{n \rightarrow \infty} \left( \frac{n+1}{n} \right)^n$

4. Use your calculator to find the approximation:  $e \approx \sum_{n=0}^7 \frac{1}{n!}$

5. Use the fact that  $e^x = \lim_{n \rightarrow \infty} \left( 1 + \frac{x}{n} \right)^n$  to find each limit below in terms of e.

Verify with your calculator! (enter into y= menu and check the table for  $n = 1000$ )

a)  $\lim_{n \rightarrow \infty} \left( 1 + \frac{1}{n} \right)^{2n}$                       b)  $\lim_{n \rightarrow \infty} \left( 1 + \frac{1}{2n} \right)^n$                       c)  $\lim_{n \rightarrow \infty} \left( 1 - \frac{1}{n} \right)^n$

d)  $\lim_{n \rightarrow 0} (1+n)^{1/n}$                       e)  $\lim_{n \rightarrow \infty} \left( 1 + \frac{3}{n} \right)^n$                       f)  $\lim_{n \rightarrow \infty} \left( 1 + \frac{\sqrt{2}}{n} \right)^n$

6. Write out the first five terms of the expansion for each of the following and check with your calculator:

a)  $e^2$

b)  $e^{\sqrt{5}}$

c)  $e^{-2}$

d)  $e^{1/2}$

7. a) Explain why  $x^i$  has no meaning generally.

b) Give the binomial expansion of  $e^i$ .

c) What does your calculator think? Does it give a value for  $e^i$ ?

8. a) Write the binomial expansion for  $e^{xi}$ .

b) Separate your expansion into a + bi form

c) Find an expansion to 5 terms for each of the following. Calculate an approximate value and then verify with your calculator.

i)  $e^{2i}$

ii)  $e^{\pi i}$

9. a) If  $e^{xi} = \cos x + i \sin x$ , derive the series expansions for  $\cos(x)$  and  $\sin(x)$  from the expansion for  $e$ . Verify these on your calculator.

(Hint:  $\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$  ..)

b) Use your expansions to find the first five terms of each of the following. Verify with your calculator.

i)  $\sin 2$

ii)  $\cos 1$

iii)  $\sin \pi/3$