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Test

21.10.24

Name: Maanya
Start time: 9:05
End time: 10:16

Total time: 75 mins

$$1) a) u_n = 8 + (n-1)18 = 18n - 10 \quad A1$$

$$b) S_n = \sum_{k=1}^n (18k - 10) \quad A1$$

$$c) S_{15} = \frac{15}{2} (2 \cdot 8 + (15-1)18) \quad M1$$

$$= \underline{\underline{2010}} \quad A1$$

4/4

$$2) u_n = u_1 r^{n-1}$$

$$500 = 2 \cdot 1.05^{n-1} \quad M1$$

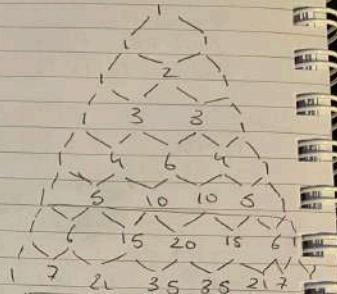
$$n = 114.1695 \dots \quad M1A1 \quad [Using G.D.C]$$

$$u_{115} = 2 \cdot 1.05^{114}$$

$$= 520.7269916 \quad A1$$

4/5

$$3. (1 - 2x)^5$$



$$(1 - 2x)^5 = [1 + (-2x)]^5 = 1^5 + 5 \cdot 1^4 \cdot (-2x)^1 + 10 \cdot 1^3 \cdot (-2x)^2 + 10 \cdot 1^2 \cdot (-2x)^3 + 5 \cdot 1 \cdot (-2x)^4 + (-2x)^5$$

$$= \underbrace{1 - 10x + 40x^2}_{\text{first 3 terms}} \quad M1$$

$$(1 + x)^7 = 1^7 + (7 \cdot 1^6 \cdot x^1) + (21 \cdot 1^5 \cdot x^2) \quad \dots$$

$$= \underbrace{1 + 7x + 21x^2}_{\text{first 3 terms}} \quad M1$$

$$(1 - 10x + 40x^2)(1 + 7x + 21x^2)$$

$$1 + 7x + 21x^2 - 10x - 70x^2 - 210x^3 \cancel{+}$$

$$+ 40x^2 + 280x^3 + 840x^4$$

Aus: $\underbrace{1 - 3x - 9x^2}_{\text{first 3 terms}}$ A1A1A1

5/5

4. N/A Haven't done complex numbers

5. $f(x) - g(x) \leq 0$

$$\frac{x+4}{x+1} - \frac{x-2}{x-4} \stackrel{\text{M1}}{=} \frac{(x+4)(x-4)}{(x+1)(x-4)} = \frac{x^2-16}{x^2-3x-4} = \frac{(x+4)(x-4)}{(x+1)(x-4)} = x-4$$

$$\frac{x-14}{(x+1)(x-4)} \stackrel{\text{A1}}{=} \frac{2-14}{3+2} = \frac{-12}{5+2} = -2x$$

$x < -1$ or $4 < x \leq 14$ A1A1 5/6

6. $\left(1 + \frac{n}{2}\right)^n$

a) $n_{C_3} = 70$ M1A1

$$70 = \frac{n!}{3!(n-3)!} \stackrel{\text{A1}}{=} \left(\frac{n}{2}\right)^3 = \frac{n^3}{8}$$

$$\binom{n}{3} = 860 \stackrel{\text{A1}}{=} \left(\frac{n}{3}\right) \cdot \frac{1}{8} = 70$$

$$\frac{n(n-1)(n-2)}{6} = 560 \stackrel{\text{M1}}{=}$$

$$n(n-1)(n-2) = 3360$$

Aus: $n = 16$ A1 (Using G.D.C.)

b) $\binom{16}{2} \cdot \left(\frac{n^2}{4}\right)$

$$\frac{16 \cdot 15}{2} = 120 \quad 120 \cdot \frac{1^2}{4} = 30x^2$$

\downarrow

Aus: 30 A1 coefficient

6/6

7. PV : 5000 r = 6.3 k = 1

a) $FV = 5000 \times \left(1 + \frac{6.3}{100}\right)^n$ A1

b) $5000 \times \left(1 + \frac{6.3}{100}\right)^5$
 $FV = 6786.351134$
 $\approx \$6786$ A1

c)

(i) $5000 \times \left(1 + \frac{6.3}{100}\right)^n > 10000$ A1

(ii) $5000 \times \left(1 + \frac{6.3}{100}\right)^n = 10000$ M1

$n = 11.34538102$ (using GDC)
A1
A1

so $n = 12$

6/6

8. $f(2) = f(-1)$ M1M1

$8 + 12 + 2a + b = -1 + 3 - a + b$
A1A1

$20 + 2a + b = 2 - a + b$

$3a = -18$ A1
 $a = -6$ A1

9. N/A

6/6

10. N/A