

GOSFORD HIGH SCHOOL
EXTENSION 1 MATHEMATICS
PRELIMINARY COURSE
ASSESSMENT TASK 1
March 2011

Start each question on a new page.

Question 1.

a) Solve for x :

i) $\frac{4}{x+1} \geq 3$ (2)

ii) $\frac{6}{|x+1|} < 2$ (2)

iii) $3(x+1)(x-1)(x-2) \leq 0$ (2)

iv) $(x-1)^2(x+1) \leq 0$ (2)

v) $0 < \frac{x^2 - 4}{x}$ (3)

vi) $\frac{4x+3}{x+1} \geq 4$ (3)

b) On a number line graph your solution to a) part iii above.

Question 3.(Start a new page)

a) Factorise

i) $5x^2 - 20y^2$ (2)

ii) $20 - 9x - 20x^2$ (2)

iii) $x^2 + 6x + 9 - y^2$ (2)

iv) $x^4 - 21x^2y^2 + 4y^4$ (3)

b) Simplify $\left(p^{\frac{1}{3}} - q^{\frac{1}{3}}\right)\left(p^{\frac{2}{3}} + p^{\frac{1}{3}}q^{\frac{1}{3}} + q^{\frac{2}{3}}\right)$ (1)

c) Simplify $\frac{2^{n+1} - 2^{n-1}}{2^n}$ (2)

d) Simplify $\frac{1-x}{x^2-1} - \frac{1+x}{1-x^2}$ (2)

e) Simplify $\frac{x^4 - 8x}{x^2 - 4x - 5} \times \frac{x^2 + 2x + 1}{x^3 - x^2 - 2x} \div \frac{x^2 + 2x + 4}{x - 5}$ (3)

f) Simplify $\frac{8x}{x^2 + 5x + 6} - \frac{5x}{x^2 + 3x + 2} - \frac{3x}{x^2 + 4x + 3}$ (3)

g) Given that $\left(a + \frac{1}{a}\right)^2 = 3$ evaluate $a^3 + \frac{1}{a^3}$. (3)

Ext 1 Preliminary Assessment Task 1 - 2021

a) $\frac{4}{x+1} \geq 3$

critical pts.
 $= -1$
 and $\frac{4}{x+1} = 3$
 $4 = 3x + 3$
 $1 = 3x$
 $x = \frac{1}{3}$

at $x = 0$:
 $\frac{4}{1} \geq 3$ true
 $-1 < x \leq \frac{1}{3}$

$\frac{6}{|x+1|} < 2$
 $6 < 2|x+1|$
 $3 < |x+1|$
 $x+1 < -3$ or $x+1 > 3$
 $x < -4$ or $x > 2$

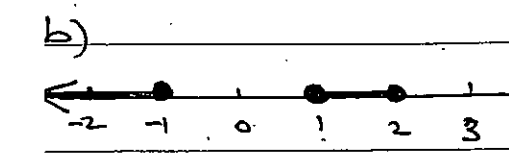
$3(x+1)(x-1)(x-2) \leq 0$
 $x \leq -1, 1 \leq x \leq 2$

$(x-1)^2(x+1) \leq 0$
 $x \leq -1$ or $x = 1$

v) $0 < \frac{x^2-4}{x}$

critical pts. $x=0$
 and $x^2-4=0$
 $(x-2)(x+2)=0$
 $x=2, -2$

vi) $\frac{4x+3}{x+1} \geq 4$
 $\frac{(x+1)(4x+3)}{x+1} \geq 4(x+1)^2$
 $(x+1)(4x+3) \geq 4(x^2+2x+1)$
 $4x^2+7x+3 \geq 4x^2+8x+4$
 $x \leq -1$



Q2) a) $26 \times 26 \times 10 \times 10 \times 10$
 $= 676000$

b) ${}^8P_3 = 336$

c) i) $9!$
 $= 362880$

ii) $5! \times 4! \times 2$
 $= 5760$

iii) $5! \times 4!$
 $= 2880$

iv) $8! \times 2!$
 $= 80640$

v) $362880 - 80640$
 $= 282240$

vi) $6! \times 2! \times 3!$
 $= 8640$

d) $\frac{6!}{3!}$
 $= 120$

e) $\frac{9!}{3!5!}$
 $= 504$

f) i) ${}^7C_4 \times {}^6C_3$
 $= 700$

ii) ${}^6C_4 \times {}^5C_2$
 $= 150$

iii) ${}^6C_3 \times {}^5C_3 \times 2 + {}^5C_4 \times {}^6C_3$
 $= 400 + 100$
 $= 500$

Q3) i) $5x^2 - 20y^2$
 $= 5(x^2 - 4y^2)$
 $= 5(x-2y)(x+2y)$

ii) $20 - 9x - 20x^2$
 $4 \times -5x$
 $5 \times 4x$

$(4-5x)(5+4x)$