Yr 11 2001 Mathematics

Yr 11 - 2U

SGHS

Marks

QUESTION 1 **(16 marks)**

a) Find, correct to three significant figures, $\frac{325.78-36}{\sqrt{62.1+3.2^2}}$ 2

b) The volume of a sphere is given by $V=\frac{4}{3}\pi r^3$. What is the radius of a sphere with a volume of 5cm^3, correct to three decimal places? 2

c) Expand and simplify $(3x+1)^2$. 1

d) Factorise fully:

i) $2x^2+3x-2$ 2

ii) $3x+3+x^3+x^2$ 2

iii) $27x^3-8$. 2

e) Simplify

i) $3\sqrt{15}\times 2\sqrt{5}$ 2

ii) $3\sqrt{18}+4\sqrt{12}-2\sqrt{108}$. 3

QUESTION 2 **(15 marks)**

a) Simplify:

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

ii) $\frac{x^2-1}{x^2-x}\times\frac{x^2}{x+1}$ 3

iii) $\frac{1}{x^2+x}+\frac{1}{x+1}$ 3

b) Write $\frac{4}{2+\sqrt{5}}$ with a rational denominator. 2

c) Solve the pair of simultaneous equations: 3

$$2x+y=7$$
$$x-2y=1$$

d) If $x=\frac{2}{3}$ and $y=-\frac{1}{2}$, evaluate $\frac{x-y}{x^2}$. 2

QUESTION 3 **(14 marks)**

a) Solve:

i) $3x^2=13x-10$ 3

ii) $|2x-1|=5$ 2

iii) $5-3x<7$ 2

b) Solve $x^2-2x-1=0$ by the method of completing the square. 2

c) i) Solve $|x+2|\leq 3$, and 2

ii) Graph the solution on the number line. 1

d) Show that $0.2\dot{3}$ is a rational number. 2

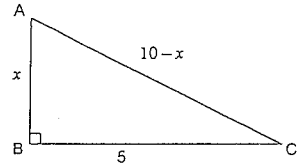
QUESTION 4 **(15 marks)**

a) Find the values of a and b, given $(a+\sqrt{3})^2=b+4\sqrt{3}$, and a and b are integers. 3

b) Write $\frac{9^x\times 8^{2x}}{12^{x+1}}$ in terms of powers of 2 and 3. 3

c) Solve $|x+1|=3x-5$. 3

d) In the diagram, $\angle ABC$ is a right angle. Find the value of x. 3



e) The value of a certain fraction becomes $\frac{1}{2}$ if one is added to the numerator, but it becomes $\frac{1}{6}$ if two is added to its denominator. Using algebra, find the fraction. 3

---------- END OF EXAM----------

Yr 11 2009 HY 2U

1) a) 34.0705509
$\doteq 34.1$ (3 sig figs)

b) $5 = \frac{4}{3}\pi r^3$

$15 = 4\pi r^3$

$r^3 = \frac{15}{4\pi}$

$r = \sqrt[3]{\frac{15}{4\pi}}$

$r = 1.061$ cm

c) $9x^2 + 6x + 1$

d) i) $2x^2 + 4x - x - 2$
$2x(x+2) - (x+2)$
$(x+2)(2x-1)$

ii) $3(x+1) + x^2(x+1)$
$(3+x^2)(x+1)$

iii) $(3x-2)(9x^2+6x+4)$

e) i) $6\sqrt{75}$
$6\sqrt{25 \times 3}$
$30\sqrt{3}$

ii) $3\sqrt{9 \times 2} + 4\sqrt{4 \times 3} - 2\sqrt{36 \times 3}$
$9\sqrt{2} + 8\sqrt{3} - 12\sqrt{3}$
$= 9\sqrt{2} - 4\sqrt{3}$

2a) i) $\frac{8 + 3x - 3}{12}$

$= \frac{5 + 3x}{12}$

ii) $\frac{(x-1)(x+1)}{x(x-1)} \times \frac{x^2}{x+1}$

$= x$

iii) $\frac{1}{x(x+1)} + \frac{1}{x+1}$

$= \frac{1+x}{x(x+1)}$

$= \frac{1}{x}$

b) $\frac{4}{2+\sqrt{5}} \times \frac{2-\sqrt{5}}{2-\sqrt{5}}$

$= \frac{8 - 4\sqrt{5}}{4 - 5}$

$= 4\sqrt{5} - 8$

c) $2x + y = 7$ — (1)
$x - 2y = 1$ — (2)

(1) $\times$ 2
$4x + 2y = 14$ — (3)
$x - 2y = 1$ — (2)

(3) + (2)

$5x = 15$

$\boxed{x = 3}$

sub into 1

$6 + y = 7$

$\boxed{y = 1}$

d) $\frac{x - y}{x^2}$

$= \frac{\frac{1}{3} + \frac{1}{2}}{\left(\frac{2}{3}\right)^2}$

$= \frac{\frac{4+3}{6}}{\frac{4}{9}}$

$= \frac{\frac{7}{6}}{\frac{4}{9}}$

$= \frac{63}{24}$

$= \frac{21}{8}$

$= 2\frac{5}{8}$

3i) $3x^2 - 13x + 10 = 0$
$3x^2 - 3x - 10x + 10 = 0$
$3x(x-1) - 10(x-1) = 0$
$(3x-10)(x-1) = 0$
$x = 1$ or $3\frac{1}{3}$

ii) $2x - 1 = 5$ or $2x - 1 = -5$
$2x = 6$ $2x = -4$
$x = 3$ or $x = -2$

iii) $5 - 3x < 7$

$-3x < 2$

$x > -\frac{2}{3}$

b) $x^2 - 2x + 1 = 1 + 1$

$(x-1)^2 = 2$

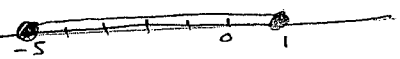
$x - 1 = \pm\sqrt{2}$

$x = 1 \pm \sqrt{2}$

c) i) $x + 2 \leq 3$ or $x + 2 \geq -3$

$-5 \leq x \leq 1$

ii)



d) Let $x = 0.23333\ldots$

$10x = 2.3333\ldots$

$100x = 23.333\ldots$

$90x = 21$

$x = \frac{21}{90}$

$x = \frac{7}{30}$

Q4)

a)

$a^2 + 2a\sqrt{3} + 3 = b + 4\sqrt{3}$

$2a = 4$

$\therefore \boxed{a = 2}$

$4 + 4\sqrt{3} + 3 = b + 4\sqrt{3}$

$7 + 4\sqrt{3} = b + 4\sqrt{3}$

$\boxed{b = 7}$

b) $\frac{3^{2x} \times 2^{6x}}{3^{x+1} \times 2^{2x+2}}$

$= 3^{x-1} \times 2^{4x-2}$

c) $x + 1 = 3x - 5$

or

$x + 1 = -3x + 5$

$-2x = -6$ or $4x = 4$

$x = +3$ $x = 1$

Test $x = +3$

$LHS = |+3+1|$

$= 4$

$RHS = 3(+3) - 5$

$= 4$

$LHS = RHS$

$\therefore x = 3$ is a solution

Test $x = 1$

$LHS = |1+1|$

$= 2$

$RHS = 3(1) - 5$

$= -2$

$LHS \neq RHS$

$\therefore x = 1$ not a solution

$\therefore$ no solution

d) $(10 - x)^2 = 5^2 + x^2$

$100 - 20x + x^2 = 25 + x^2$

$20x = 75$

$x = 3.75$

e) $\frac{x+1}{y} = \frac{1}{2}$

$\frac{x}{y+2} = \frac{1}{6}$

$2x + 2 = y$ (1)

$6x = y + 2$ (2)

sub (1) into 2

$6x = 2x + 2 + 2$

$4x = 4$

$\boxed{x = 1}$

$2 + 2 = y$

$\boxed{y = 4}$

Fraction is $\frac{1}{4}$