

Y11 Ext.1 2008 Task 1

Question 1 (12 marks)

- (a) Find, correct to two decimal places, the value of $\frac{2.7 \times \sqrt{41.6}}{24.9}$. 1
- (b) The distance from the earth to the sun is 149 492 000 km. Write this number in scientific notation, correct to four significant figures. 1
- (c) Express $0.2\dot{5}$ as a fraction in simplest rational form. 2
- (d) Simplify $\sqrt{27} - \sqrt{3} + \sqrt{8}$. 2
- (e) Expand and simplify $(3\sqrt{5} + 4\sqrt{3})(\sqrt{5} - 5\sqrt{3})$. 2
- (f) Rationalise the denominator of $\frac{7}{\sqrt{5} - 2}$. 2
- (g) Evaluate $|x - 10| - |10x|$ when $x = 3$. 2

Question 2 (23 marks)

- (a) Factorise completely 1
- (i) $2x^2y - 8xy^2$ 3
- (ii) $a^2b - ab - a^2 + a$ 2
- (iii) $3x^2 - 17x + 10$ 2
- (iv) $x^4 - y^4$ 2
- (v) $x^7 - y^7$ 2
- (b) Write each of the following as a single fraction in simplest form: 2
- (i) $\frac{1}{x^2y^3} - \frac{1}{x^3y^4}$ 2
- (ii) $\frac{a^2 - a - 12}{a^2 - 9} \times \frac{6a - 18}{18a}$ 3
- (iii) $\frac{x^3 + 1}{x^3 - x^2 + x}$ 2
- (c) Expand and simplify $(2x - 3)^4$ 3
- (d) Solve the equation $\frac{x-5}{6} + \frac{3x-5}{2} = 1$ 2
- (e) Solve the following inequation: 2
- $12 - 8x + x^2 < 0$

Question 3 (24 marks)

- (a) The function $f(x)$ is defined as $f(x) = \begin{cases} -3x & \text{for } -4 \leq x < 0 \\ 9 - x^2 & \text{for } 0 \leq x \leq 3 \end{cases}$
- (i) Evaluate $f(0)$ 1
- (ii) Sketch the graph of $y = f(x)$ 3
- (iii) State the range of $y = f(x)$. 1
- (b) If $g(x) = |x| + 1$, for what values of x does $g(x) = 3$? 2
- (c) Find the domain and range of $f(x) = \sqrt{4 - x^2}$. 2
- (d) Sketch the following relations on separate number planes, showing all important features (including x and y intercepts):
- (i) $y = x^2 + 2x$ 2
- (ii) $(x - 3)^2 + y^2 = 4$ 2
- (iii) $y = \frac{1}{x + 2}$ 2
- (iv) $y = \sqrt{x - 1}$ in the domain $1 \leq x \leq 5$ 2
- (v) $y = 1 + 2^x$ 2
- (vi) $y = |x - 1| - 1$ 2
- (e) (i) Sketch $y = -x^2(x - 2)$ 2
- (ii) Hence solve $-x^2(x - 2) < 0$. 1

Question 4 (10 marks)

- (a) Consider the function $y = \frac{1 - x^2}{x}$.
- (i) Show that this function is an odd function. 2
- (ii) Explain how this information helps to sketch its graph. 1
- (iii) Sketch the function $y = \frac{1 - x^2}{x}$. 3
- (b) (i) Graph $y = |3 + x|$ and $y = -x - 1$ on the same number plane. 2
- (ii) Hence solve $|3 + x| < -x - 1$. 2

Q1) a) 0.70

b) 1.495×10^8

c) Let $x = 0.255...$

$10x = 2.555...$

$100x = 25.555...$

$90x = 23$

$x = \frac{23}{90}$

d) $3\sqrt{3} - \sqrt{3} + 2\sqrt{2}$
 $= 2\sqrt{3} + 2\sqrt{2}$

e) $15 - 15\sqrt{15} + 4\sqrt{15} - 60$
 $= -45 - 11\sqrt{15}$

f) $\frac{7}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}$
 $= 7\sqrt{5} + 14$

g) $|-7| - |30|$
 $= -23$

Q2) a) i/ $2xy(x-4y)$

ii/ $ab(a-1) - a(a-1)$
 $= (a-1)(ab-a)$
 $= a(a-1)(b-1)$

iii/ $(3x-2)(x-5)$

iv/ $(x^2-y^2)(x^2+y^2)$
 $= (x+y)(x-y)(x^2+y^2)$

v/ $(x-y)(x^6+x^5y+x^4y^2+x^3y^3+x^2y^4+xy^5+y^6)$

b) i/ $\frac{xy-1}{x^3y^4}$

ii/ $\frac{(a-4)(a+3)}{(a+3)(a-3)} \times \frac{6(a-3)}{3+8a}$
 $= \frac{a-4}{3a}$

iii/ $\frac{(x+1)(x^2-x+1)}{x(x^2-x+1)}$
 $= \frac{x+1}{x}$

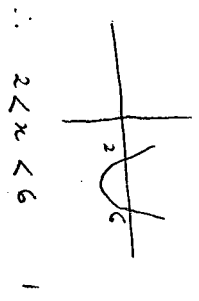
c) $(2x)^4 + 4(2x)^3(-3) + 6(2x)^2(-3)^2 + 4(2x)(-3)^3 + (-3)^4$

$= 16x^4 - 96x^3 + 216x^2 - 216x + 81$

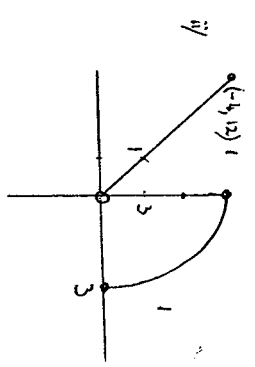
1 1
 1 2 1
 1 3 3 1
 1 4 6 4 1

d) $(x-5) + 3(3x-5) = 6$
 $x-5 + 9x-15 = 6$
 $10x = 26$
 $x = 2.6$

e) $(6-x)(2-x) < 0$



Q3) a) i/ 9



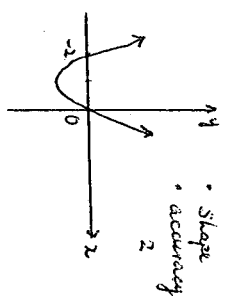
iii/ $0 \leq y \leq 12$

b) $|x| + 1 = 3$

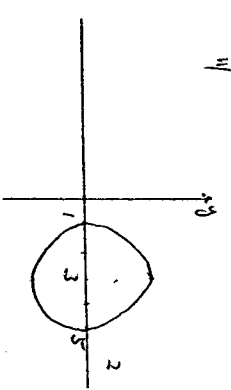
$x+1 = 3 \quad -x+1 = 3$
 $x = 2 \quad x = -2$

c) $-2 \leq x \leq 2$
 $0 \leq y \leq 2$

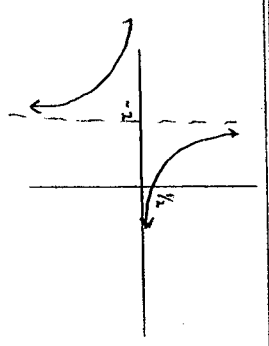
d) i/ Slope
 accuracy



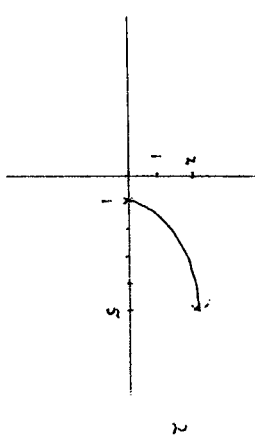
ii/



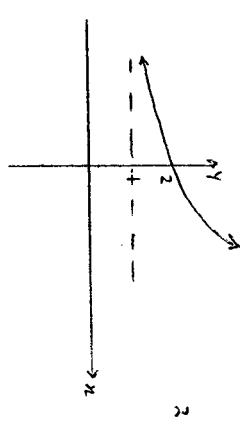
iii/



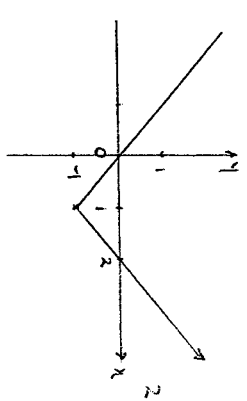
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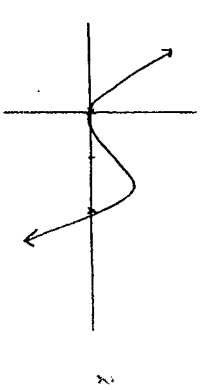
v/



vi/



e) i/



ii/

$x > 2$

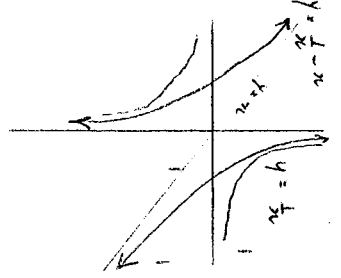
Q4) i/ $f(x) = \frac{1-x^2}{x}$

$f(-x) = \frac{1-(-x)^2}{-x}$

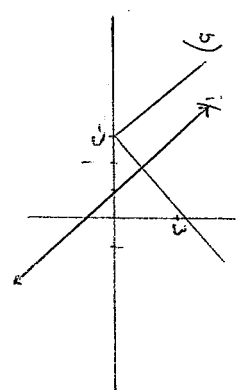
$= -f(x)$
 $\therefore$ odd

if pt symmetric about origin

iii/ $y = \frac{1}{x}$



b)



ii/ $x < -2$