

①

TEST 2  
943-DW  
FALL 2010  
SOLUTIONS

① (i)  $x^2 - 10x + 22 = 0$

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4(1)(22)}}{2(1)}$$

$$= \frac{10 \pm \sqrt{100 - 88}}{2}$$

$$= \frac{10 \pm \sqrt{12}}{2} = \frac{10 \pm 2\sqrt{3}}{2} = \boxed{5 \pm \sqrt{3}}$$

6.732  
3.26

(ii)  $(x+1)^2 = 6$

$$x^2 + 2x + 1 = 6$$

$$x^2 + 2x - 5 = 0$$

$$x = \frac{-2 \pm \sqrt{4 - 4(1)(-5)}}{2} = \frac{-2 \pm \sqrt{24}}{2}$$

$$= \frac{-2 \pm 2\sqrt{6}}{2} = \boxed{-1 \pm \sqrt{6}}$$

(iii)  $\frac{1}{x-4} - \frac{3}{x+4} - \frac{6}{5x} = 0$

Multiply both sides by  $(x-4)(x+4)5x$

$$(x+4)5x - 3(x-4)5x - 6(x-4)(x+4) = 0$$

$$(5x^2 + 20x) - (15x^2 - 60x) - 6(x^2 - 16) = 0$$

$$5x^2 + 20x - 15x^2 + 60x - 6x^2 + 96 = 0$$

$$-16x^2 + 80x + 96 = 0$$

$$-16x^2 + 80x + 96 = 0$$

$$-4x^2 + 20x + 24 = 0$$

$$x = \frac{-20 \pm \sqrt{20^2 - 4(-4)(24)}}{2(-4)}$$

$$= \frac{-20 \pm 28}{-8}$$

$$x = \frac{-48}{-8} = 6 \quad \text{or} \quad x = \frac{8}{-8} = -1$$

SOLUTIONS 6 & -1

(iv)  $1 - \frac{12}{x^2 - 4} = \frac{3}{x + 2}$

$1 - \frac{12}{(x-2)(x+2)} = \frac{3}{x+2}$

$$(x-2)(x+2) - 12 = 3(x-2)$$

$$x^2 - 4 - 12 = 3x - 6$$

$$x^2 - 3x - 10 = 0$$

$$(x-5)(x+2) = 0$$

$x = 5 \text{ \& } x = -2$

(-2 is NOT A SOLUTION, IT CAUSED div. by 0)

(v)  $\frac{3}{t+3} - \frac{1}{t} = \frac{5}{2t+6}$

$$\frac{3}{t+3} - \frac{1}{t} = \frac{5}{2(t+3)}$$

MULTIPLY BOTH SIDES BY  $t+3$  &  $t$

$$3t - (t+3) = \frac{5t}{2}$$

MULTIPLY BY 2

$$6t - 2(t+3) = 5t$$

$$6t - 2t - 6 = 5t$$

$$-t = 6$$

$t = -6$

Q2

$$m = \frac{2 - \frac{1}{2}}{\frac{3}{4} + 1} = \frac{\frac{3}{2}}{\frac{7}{4}} = \frac{3}{2} \cdot \frac{4}{7} = \frac{6}{7}$$

$$y = \frac{6}{7}x + b$$

replace  $(-1, \frac{1}{2})$

$$\frac{1}{2} = \frac{6}{7}(-1) + b$$

$$\frac{7}{14} = \frac{-12}{14} + b \implies b = \frac{7}{14} + \frac{12}{14} = \frac{19}{14}$$

$$y = \frac{6}{7}x + \frac{19}{14}$$

Q3

(i)  $3y - 2x + 7 = 0$

$$3y = 2x - 7$$

$$y = \frac{2}{3}x - \frac{7}{3}$$

Slope  $\frac{2}{3}$       y-intercept  $-\frac{7}{3}$

(ii)

$$\frac{\pi}{3}y - 14x = \frac{6}{\pi}$$

$$\frac{\pi}{3}y = 14x + \frac{6}{\pi}$$

$$y = \frac{3}{\pi} \left( 14x + \frac{6}{\pi} \right)$$

$$= \frac{42}{\pi}x + \frac{18}{\pi^2}$$

Slope  $\frac{42}{\pi}$       y-intercept  $\frac{18}{\pi^2}$

(Q4) (i)  $f(x) = \frac{5x}{x-3}$   $\mathbb{R} \setminus \{3\}$  (4)

(ii)  $g(z) = \frac{1}{\sqrt{z}}$   $(0, \infty)$

(iii)  $h(t) = \frac{15}{t^3 - 9t} = \frac{15}{t(t^2 - 9)} = \frac{15}{t(t+3)(t-3)}$

DOMAIN:  $\mathbb{R} \setminus \{0, \pm 3\}$

(iv)  $f(x) = \frac{\sqrt{x-3}}{x-5}$  DOMAIN:  $(3, 5) \cup (5, \infty)$

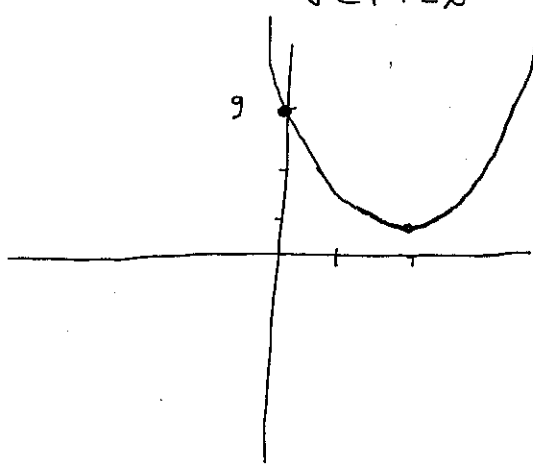
(v)  $f(x) = \sqrt{3x+2}$  DOMAIN:  $[-\frac{2}{3}, \infty)$

(Q5) (i) y-intercept  $x=0$   $y=9$   
x-intercepts  $y=0$   $0 = 2x^2 - 8x + 9$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(2)(9)}}{2(2)}$$
$$= \frac{8 \pm \sqrt{64 - 72}}{4}$$

one x-intercept

vertex  $x = \frac{8}{4} = 2$   $y = 1$



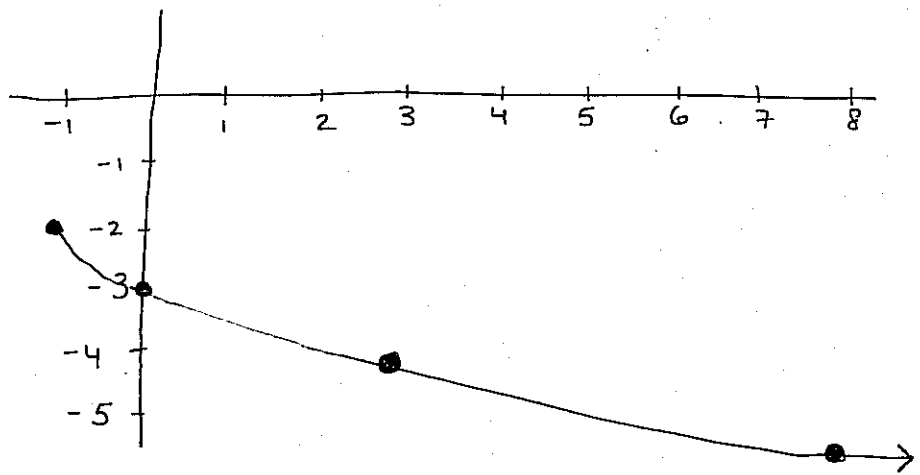
(ii) DOMAIN  $\mathbb{R}$  RANGE  $[1, \infty)$   
(iii) DOMAIN  $\mathbb{R}$

Q6

5

(i)

x	y
-1	-2
0	-3
3	-4
8	-5

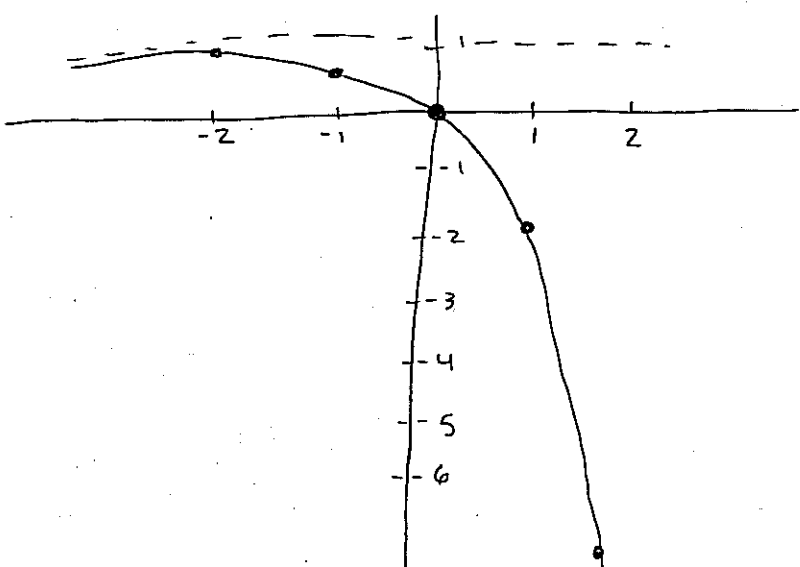


(ii) DOMAIN  $[-1, \infty)$   
 RANGE  $(-\infty, -2]$

Q7

(i)

x	-2	-1	0	1	2
y	$\frac{8}{9}$	$\frac{2}{3}$	0	-2	-8



(ii) DOMAIN  $\mathbb{R}$   
 RANGE  $(-\infty, 1)$

(Q8)

(6)

$$f(x) = 2x^2 - x + 1$$

$$g(x) = 3x - 4$$

(i)  $f(-2) = 11$

(ii)  $g(-2) = -10$

(iii)  $f(a^2+1) = 2(a^2+1)^2 - (a^2+1) + 1$   
 $= 2(a^4+2a^2+1) - (a^2+1) + 1$   
 $= 2a^4 + 3a^2 + 2$

(iv)  $g(a^2) - f(a)$   
 $= 3a^2 - 4 - (2a^2 - a + 1)$   
 $= a^2 + a - 5$

(v)  $f(x+1) - (f(x) + 1)$   
 $= 2(x+1)^2 - (x+1) + 1 - (2x^2 - x + 1 + 1)$   
 $= 2(x^2 + 2x + 1) - x - 1 + 1 - 2x^2 + x - 2$   
 $= 2x^2 + 4x + 2 - x - 2x^2 + x - 2$   
 $= \boxed{4x}$

(vi)  $\frac{g(x+h) - g(h)}{h}$   
 $= \frac{3(x+h) - 4 - (3x - 4)}{h}$   
 $= \frac{3x + 3h - 4 - 3x + 4}{h}$   
 $= \frac{3h}{h} = \boxed{3}$

(vii)  $2 = 2x^2 - x + 1$   
 $0 = 2x^2 - x - 1$   
 $= 2x^2 - 2x + x - 1$   
 $= 2x(x-1) + 1(x-1)$   
 $= (2x+1)(x-1)$   
 $\boxed{x = -\frac{1}{2} \text{ \& } x = 1}$

(viii)  $-5 = 3x - 4$   
 $-1 = 3x$   
 $\boxed{x = -\frac{1}{3}}$

Q9

$$\begin{aligned}
 (a) \quad & 6x^2 + 7x - 10 \\
 &= 6x^2 + 12x - 5x - 10 \\
 &= 6x(x+2) - 5(x+2) \\
 &= \boxed{(6x-5)(x+2)}
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad & x^2 + x - 20 \\
 &= \boxed{(x+5)(x-4)}
 \end{aligned}$$

$$\begin{aligned}
 (c) \quad & x^3 - 125 \\
 &= \boxed{(x-5)(x^2+5x+25)}
 \end{aligned}$$

$$\begin{aligned}
 (d) \quad & 16x^2 - 1 \\
 &= \boxed{(4x+1)(4x-1)}
 \end{aligned}$$

$$\begin{aligned}
 (e) \quad & 18x^2 - 9x - 5 \\
 &= 18x^2 - 15x + 6x - 5 \\
 &= 3x(6x-5) + 1(6x-5) \\
 &= \boxed{(3x+1)(6x-5)}
 \end{aligned}$$

Q10

$$\begin{aligned}
 & x^3 + 64 = 0 \\
 \text{FACTORED } & (x+4)(x^2 - 4x + 16) = 0
 \end{aligned}$$

SOLUTION  $x = -4$

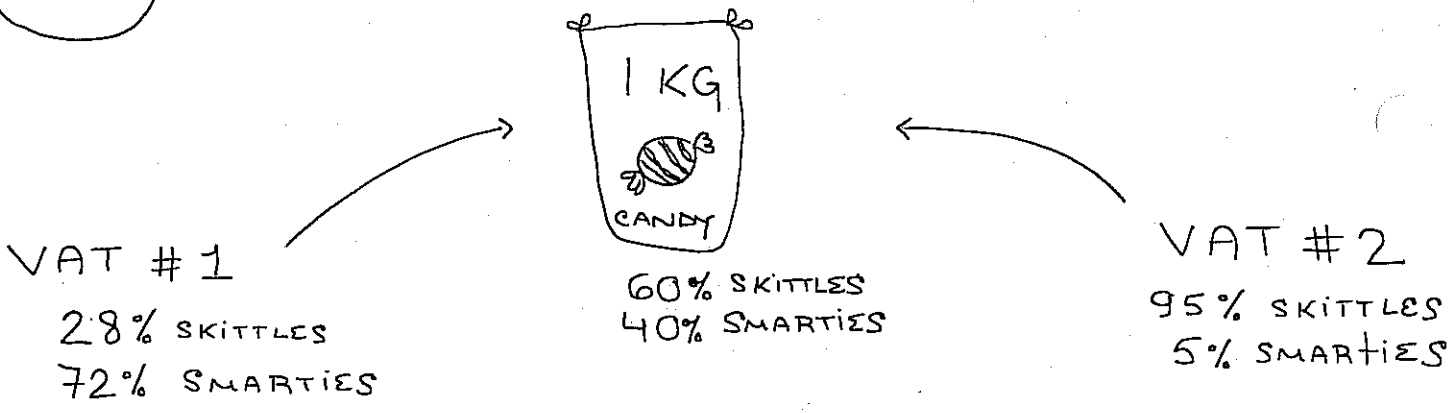
NO OTHER SOLUTIONS :

$$x^2 - 4x + 16 = 0$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(16)}}{2} = \frac{4 \pm \sqrt{-48}}{2}$$

NO SOLN

Q 11



$x$  = AMOUNT FROM VAT #1 (kg)  
 $y$  = " " VAT #2 (kg)

$$x + y = 1 \quad \rightarrow \quad y = 1 - x$$

SKITTLES EQUATIONS:

$$0.28x + 0.95y = 0.6 \quad (1)$$

$$0.28x + 0.95(1-x) = 0.6$$

$$0.28x + 0.95 - 0.95x = 0.6$$

$$-0.67x = -0.35$$

$$x = 0.52 \text{ kg}$$

$$y = 0.48 \text{ kg}$$

WE WILL TAKE 520g FROM VAT #1