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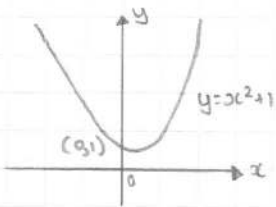
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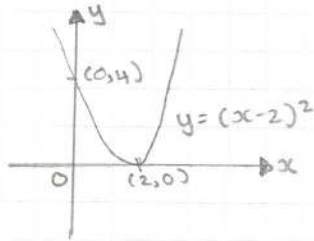
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Solution Bank 4.5

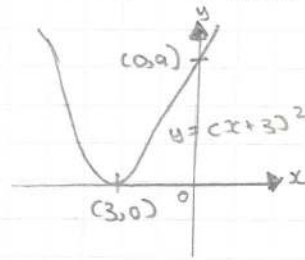
① a) $(0,0) \rightarrow (0,1)$
 $(1,1) \rightarrow (1,2)$
 (1 unit) up



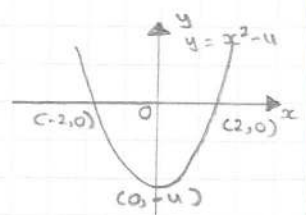
ii) $(0,0) \rightarrow (2,0)$
 $(0,4) \rightarrow (2,4)$



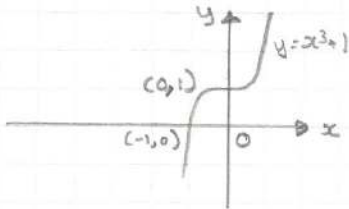
iii) vector $(\frac{3}{8})$
 $(0,0) \rightarrow (-3,0)$



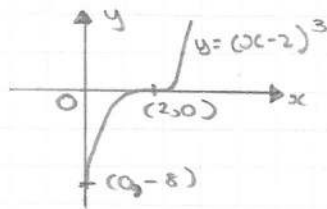
iv) vector $(-u)$
 $(0,0) \rightarrow (0,-u)$
 $(-2,0) \rightarrow (2,0)$



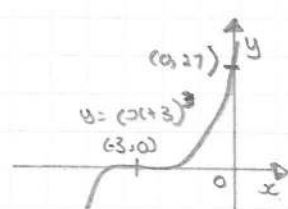
b) i) vector (9)
 $(0,1)$ does not cross x



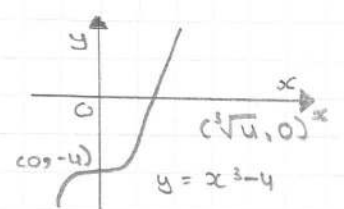
ii) $(-\frac{2}{3})$ vector
 original $(2,0)$



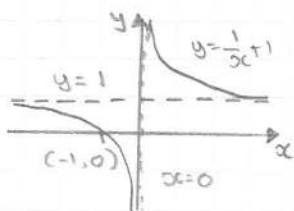
iii) vector $(\frac{3}{8})$
 original $(-3,0)$



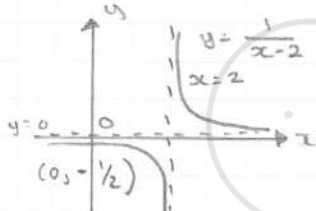
iv) vector $(-u)$
 original $(0,-u)$



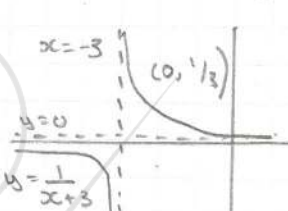
c) i) vector (9)
 asymptote $x=0$ $y=1$



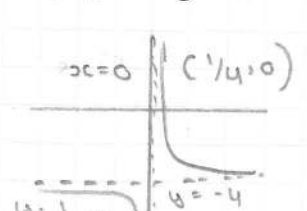
ii) vector $(-\frac{2}{3})$
 asymptote $y=0$ $x=2$



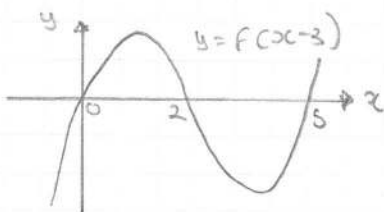
iii) vector $(\frac{3}{8})$
 asymptote $x=-3$ $y=0$



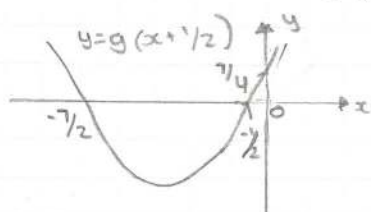
iv) vector $(0,u)$
 asymptote $y=-4$ $x=0$



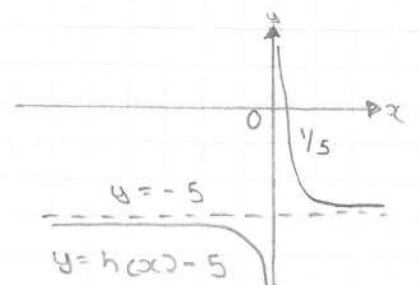
② a) $x^2 - 3x + 3 = 0$
 $x = -1 + 3 = 2$
 $x = 2 + 3 = 5$
 $f(0-3) = f(-3) = 0$
 $(0,0) (2,0) (5,0)$



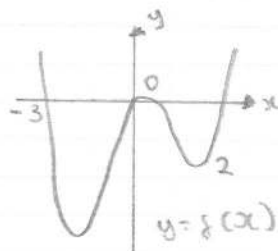
b) $x = 0 - 1/2 = -1/2$
 $x = -3 - 1/2 = -7/2$
 sub $x=0$ $g(x+1/2)$
 $g(1/2) = 1/2(1/2+3) = 1/2 \times 7/2 = 7/4$
 $(-1/2, 0) (-7/2, 0) (7/4)$



c) asymptote $x=0$ $y=-5$
 shift down 5 units

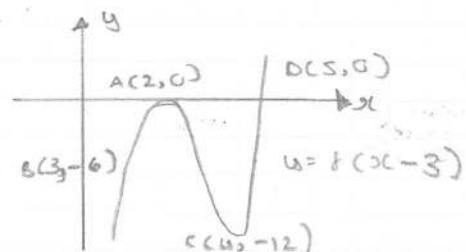


③ a) $y=0: x^2(x-2)(x+3)=0$
 $x=0$ $x=2$ $x=3$
 $x=0$
 $y = 0^2(0-2)(0+3) = 0$
 $(-3,0) (0,0) (2,0)$

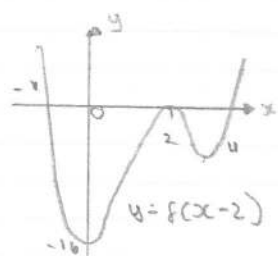


④ a) y coordinate 4 up
 vertically 4 units up (A, B, C, D)
 $A(-1,4)$ $D(2,4)$
 $B(0,-2)$ $C(1,-8)$
 $y = f(x) + 4$

b) x coordinate 3 right
 horizontally 3 right (A, B, C, D)



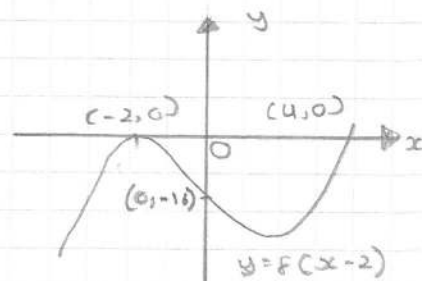
b) $y = f(x-2)$ $y = f(x)$
 x intercept $x=2$ $x=u$ $x=-1$
 (2 units right)



y intercept:
 $f(-2) = (-2)^2(-u)(1)$
 $= -16$

5) a) $(-4, 0)$ $x = -4$
 $(2, 0)$ $x = 2$
 $y = k(x+4)^2(x-2)$
 y intercept $(0, -32)$
 $x = 0$ $y = -32$
 $-32 = k(16)(-2)$
 $k: -32 = k(16)(-2)$
 $-32 = -32k$
 $k = 1$
 $y = (x+4)^2(x-2)$

b) $f(x) = (x-2)$
 $y = f(x)$
 x intercept $(-4, 0) \rightarrow (2, 0)$
 $(-2, 0)$
 $(4, 0)$
 $(0, -32) \rightarrow (0, -16)$



6) a) x axis $y = 0$ (curve cuts)
 $f(x) = x^2(6-2x) = 0$
 $x = 0$ or $6-2x = 0$
 $x = 3$
 $(0, 0)$ and $(3, 0)$
 Point A $(3, 0)$

b) $y = f(x) \rightarrow$ local max $(2, 8)$
 $y = f(x) - k$ shift $y = f(x)$ down k units
 $y = f(x) - k$ $(2, 1)$ - local max
 shifted down 7
 $8 - 1 = 7$
 $\therefore k = 7$

7) $y = f(x+a)$ horizontal translation of $y = f(x)$
 by $-a$ units
 $(0, 0)$, $f(0+a) = f(a) = 0$

Given $f(x) = (x+3)(x-2)^2$
 $f(a) = 0$
 $(a+3)(a-2)^2 = 0$
 $a+3 = 0$ $(a-2)^2 = 0$
 $a+3 = 0$ $a = -3$
 $(a-2)^2 = 0$ $a = 2$ = 2 and -3

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8) $f(x) + a = 0 \rightarrow f(x) = -a$
 represents horizontal line $y = -a$
 $f(x)$ is 3 at $x = 1$ (min value)
 7 at $x = -1$ (max value)
 line $y = -a$ intersect curve at 3 points if $-a$ between
 max + min value of $f(x)$

$\therefore 3 < -a < 7 \times -1$
 $= -7 < a < -3$