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Chapter 2 – 2.3

① a) $f(3)$
$= 3^2 - 5(3) + 6$
$= 9 - 15 + 6$
$= 0$

b) $g(22)$
$= \sqrt{22+3}$
$= \sqrt{25}$
$= 5$

c) $f(-1.5)$
$= (-1.5) - 5(-1.5) + 6$
$= 2.25 + 7.5 + 6$
$= 15.75$

d) $f(4) + g(6)$
$4^2 - (4)5 + 6$
$16 - 20 + 6 = 2$
$\sqrt{6+3} = \sqrt{9}$
$= 3$
$2 + 3 = 5$

② $r(x) = s(x)$
$x^2 + 2x - 3 = 2x + 1 = 0$
$x^2 - 4 = 0$
$(x-2)(x+2) = 0$
$x = 2 \quad x = -2$

③ a) $f(x) = (x+2)(x+7)$
$(x+2)(x+7) = 0$
$x+2 = 0 \mid x+7 = 0$
$x = -2, \quad x = -7$

b) $f(x) = 81 - x^2$
$f(x) = (9-x)(9+x)$
$f(x) = 0$
$(9-x)(9+x) = 0$
$x = 9, \quad x = -9$

c) $f(x) = x^6 + 7x^3 + 12$
$f(x) = u^2 + 7u + 12$
$(u+3)(u+4)$
$u = -3, \quad u = -4$
$x^3 = -3, \quad x^3 = -4$
$x = \sqrt[3]{-3}, \quad x = \sqrt[3]{-4}$

d) $f(x) = x^3 - 4x^2 - 21x$
$f(x) = x(x^2 - 4x - 21)$
$x^2 - 4x - 21 = (x+3)(x-7)$
$f(x) = x(x-7)(x+3)$
$x = 0, \quad x = 7, \quad x = -3$

④ a) $h(x) = x^2 + 6x + 2$
$x^2 + 6x = (x+3)^2 - 9$
$(x+3)^2 - 9 + 2$
$(x+3)^2 - 7$

b) $h(x) = 0$
$(x+3)^2 - 7 = 0$
$(x+3)^2 = 7$
$x + 3 = \pm\sqrt{7}$
$x = -3 \pm \sqrt{7}$

c) $h(x) = (x+3)^2 - 7$
$(x+3)^2 = 0$
$h(x) = -7$
$x = -3$

⑤ a) $f(x) = x^2 + 6x + 13$
$x^2 + 6x$
$(x+3)^2 - 9$
$f(x) = (x+3)^2 - 9 + 13$
$f(x) = (x+3)^2 + 4$

b) $f(x) = (x+3)^2 + 4$
$(x+3)^2$ is a square - always ≥ 0
$(x+3)^2 = 0, \quad f(x) = 0 + 4 = 4$
$(x+3)^2$ - negative $f(x) > 4$
$f(x) > 0$ for all values of x and minimum value of $f(x)$ is 4

⑥ a) $f(x) = x^8 + 6x^4 - 7$
$u^2 + 6u - 7 = 0$
$u = \dfrac{-6 \pm \sqrt{6^2 - 4(1)(-7)}}{2(1)}$
$= \dfrac{-6 \pm \sqrt{36+28}}{2}$
$= \dfrac{-6 \pm \sqrt{64}}{2}$
$= 1, -7$
$u = x^4$
$x = \pm 1$
1 and -1

b) $f(x) = 6x^{10} - 5x^5 + 1$
$6u^2 - 5u + 1$
$u = \dfrac{-(-5) \pm \sqrt{(-5)^2 - 4(6)(1)}}{2(6)}$
$= \dfrac{5 \pm \sqrt{25-24}}{12}$
$u = \dfrac{5 \pm 1}{12}$
$= \dfrac{1}{2}, \dfrac{1}{3}$
$x^5 = \dfrac{1}{2} \rightarrow x = \sqrt[5]{\dfrac{1}{2}}$
$x^5 = \dfrac{1}{3} \rightarrow x = \sqrt[5]{\dfrac{1}{3}}$
$x = \sqrt[5]{\dfrac{1}{2}}$ and $\sqrt[5]{\dfrac{1}{3}}$

c) $f(x) = x^{1/4} - 3x^{1/2} + 2$
$f(x) = y - 3y^2 + 2$
$y - 3y^2 + 2 = 0$
$y = \dfrac{1 \pm \sqrt{1+24}}{6}$
$= y = \dfrac{1 \pm 5}{6}$
$y = -2/3, 1$
$x^{1/4} = 1$
$x = 1^4 = 1$
$x^{1/2} = 4$
$x = 1$ and 4

⑦ a) $f(x) = 2^{2x} - 6(2^x) + 8$

$(2^x - a)(2^x - b)$

$f(x) = u^2 - 6u + 8$

$u^2 + 6u + 8$

$(u - 4)(u - 2)$

$u = 2^x$

$f(x) = (2^x - 4)(2^x - 2)$

b) $f(x) = 0$

$(2^x - 4)(2^x - 2) = 0$

$2^x - 4 = 0$

$2^x = 4 \longrightarrow x = 2$

$2^x - 2 = 0$

$2^x = 2 \longrightarrow x = 1$

$x = 2$ and $x = 1$