M.C.

(1) $12x^2 + 11x + 2 = 0$

$12x^2 + 8x + 3x + 2 = 0$

$4x(3x+2) + 3x + 2 = 0$

$(3x+2)(4x+1) = 0$

$3x+2 = 0 \quad 4x+1 = 0$

$x = -\frac{2}{3} \quad x = -\frac{1}{4}$

$-\frac{2}{3} - \frac{1}{4} = \frac{-8-3}{12} = \boxed{-\frac{11}{12}}$

$24 = 8 \cdot 3$

$ax^2 + bx + c = 0$

Sum of 2 solutions $= -\frac{b}{a}$.

$\frac{-b + \sqrt{b^2-4ac}}{2a} + \frac{-b - \sqrt{b^2-4ac}}{2a}$

$\frac{-2b}{2a} = -\frac{b}{a}$.

(2) $x^2 + x + 1 = 0$.

Discriminant $= b^2 - 4ac = 1 - 4 \cdot 1 \cdot 1$

$= -3 < 0$

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(3) $(x+5)^{\frac{3}{2}} = 8$

$x+5 = 8^{\frac{2}{3}} = \left(\sqrt[3]{8}\right)^2 = 2^2 = 4$

$x+5 = 4$; $\boxed{x = -1}$.

(4) $|4x+1| - 3 = 6$; $|4x+1| = 9$

$4x+1 = 9$ or $4x+1 = -9$

$4x = 8 \qquad 4x = -10$

$x = 2 \qquad x = -\frac{5}{2}$

$2 - \frac{5}{2}$

$= \frac{4-5}{2} = -\frac{1}{2}$.

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(5)

$3x^{\frac{3}{4}} = x^{\frac{1 \cdot 2}{2 \cdot 2}}$

$3x^{\frac{3}{4}} = x^{\frac{2}{4}}$

$3x^{\frac{3}{4}} - x^{\frac{2}{4}} = 0$

$x^{\frac{2}{4}}\left(3x^{\frac{1}{4}} - 1\right) = 0$

$x^{\frac{1}{2}} = 0$ or $3x^{\frac{1}{4}} - 1 = 0$

$\boxed{x = 0}$ $\qquad 3x^{\frac{1}{4}} = 1$; $x^{\frac{1}{4}} = \frac{1}{3}$; $\boxed{x = \left(\frac{1}{3}\right)^4 = \frac{1}{81}}$

(6) $g(x) = \sqrt{x-4}$. Solve the equation: $\boxed{g(x) = 2}$

$\left(\sqrt{x-4}\right)^2 = 2^2 = x - 4 = 4$; $\boxed{x = 8}$.

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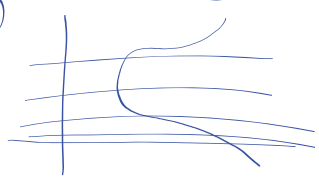
(7) $f(x) = x^2 + 3x - 4$. Find $f(a+1)$

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

$= a^2 + 2a + 1 + 3a + 3 - 4$

$= \boxed{a^2 + 5a}$.

(8)



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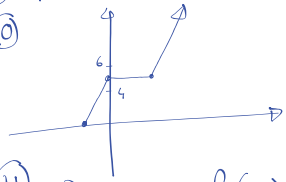
(9) $f(2) = -1$

(10)



Range: $[0, \infty)$

(11) Domain: $f(x) = -2x(x-1)(x-2)$

Domain: $(-\infty, \infty)$

(12) $g(x) = \frac{x+3}{x^2+5x+6}$ Domain: $x \neq -3, x \neq -2$

Domain: $(-\infty, -3) \cup (-3, -2) \cup (-2, \infty)$

$x^2 + 5x + 6 = 0$

$(x+3)(x+2) = 0$

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(13) Domain of $f(x) = \sqrt{4-3x}$

$4 - 3x \geq 0$

$4 \geq 3x$

$\frac{4}{3} \geq x$

$4 - 3x < 0$

$x < \frac{4}{3}$

$x > \frac{4}{3}$

$\boxed{\left(-\infty, \frac{4}{3}\right]}$.

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(14) $$f(x) = \begin{cases} x^2 - 2 & \text{if } x < 2 \\ 4 + |x-5| & \text{if } x \geq 2 \end{cases}$$

$f(2) = 4 + |2-5| = 4 + |-3|$

$= 4 + 3 = \boxed{7}$.

(15) A.R.O.C. of $f(x) = x - 2\sqrt{x}$ on $[1, 9]$.

$$\frac{f(9) - f(1)}{8} = \frac{(9 - 2\sqrt{9}) - (1 - 2\sqrt{1})}{8} = \frac{3 - (-1)}{8}$$

$\frac{4}{8} = \boxed{\frac{1}{2}}$

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(16) $f(x) = x^2 + 2x - 8$.

A.R.O.C. on $[5, a]$.

$$\frac{f(a) - f(5)}{a - 5} = \frac{a^2 + 2a - 8 - (5^2 + 2 \cdot 5 - 8)}{a - 5}$$

$$= \frac{a^2 + 2a - 8 - (27)}{a - 5}$$

$$= \frac{a^2 + 2a - 35}{a - 5} = \frac{(a-5)(a+7)}{a-5}$$

$= \boxed{a + 7}$.

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A.R.O.C.

$$\frac{f(7) - f(1)}{7 - 1} = \frac{3 - 5}{6} = \frac{-2}{6} = \boxed{-\frac{1}{3}}.$$

(18) $(1,3) \cup (5,7)$ • decreasing.

(19) $a < b \rightarrow f(a) < f(b)$

(20) $\frac{3.68 - 3.30}{2012 - 2008} = \frac{0.38}{4} = 0.095$

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(21) (a) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

(b) If $a \cdot b = 0$, then either $a = 0$ or $b = 0$

(c) A relation is set of ordered pairs.

(d) a relation in which every input leads to exactly one output.

(e) $x = \pm\sqrt{k}$

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(22) (a) $x^3 + 2x^2 - x - 2 = 0$

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

$(x^2 - 1)(x+2) = 0$

$(x-1)(x+1)(x+2) = 0$

$x = 1$ or $x = -1$ or $x = -2$.

$-18 = -9 \cdot 2$

(b) $\left(\sqrt{x+3}\right)^2 = (3x-1)^2$

$x + 3 = (3x-1)(3x-1)$

$x + 3 = 9x^2 - 3x - 3x + 1$

$x + 3 = 9x^2 - 6x + 1$

$9x^2 - 7x - 2 = 0$

$9x^2 - 9x + 2x - 2 = 0$

$9x(x-1) + 2(x-1) = 0$

$(x-1)(9x+2) = 0$

$\boxed{x = 1}$, $\boxed{x = -2/9}$

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$\boxed{x = 1}$

$\sqrt{1+3} = 3 \cdot 1 - 1$

$\sqrt{4} = 2$ ✓

$x = -\frac{2}{9}$

$\sqrt{-\frac{2}{9} + 3} = 3 \cdot \left(-\frac{2}{9}\right) - 1$

$\sqrt{\frac{25}{9}} = -\frac{15}{9} = -\frac{5}{3}$

$\sqrt{\frac{25}{9}} = -\frac{5}{3}$.

$\frac{5}{3} \neq -\frac{5}{3}$

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