

۱ $f(x)$ و x باید هم علامت باشند ضرب اینی مثبت شود (باید باشند) $f(x) \geq 0$ و $x \geq 0$
برای همین فقط زمانی که در دو طرف اهل و کفو است قابل قبول است
 $D_f = \{x | x \in [2, 5] \cup [-5, 0]\}$ ✓ (۲)

۲ $\frac{-9x}{f(x)} \geq 0$ و x و $f(x)$ باید هم علامت باشند
مثبت و مثبت شود و این اتفاق در همان جایی افتاد که جمع در آن صفری بود
 $D_f = \{x | x \in [-2, 2] \cup [0, 2]\}$
 $D_f = (-3, 2) - \{0\}$
در x و $f(x)$ هم علامت باشند پس زیر را شکل قطعی منفی است و با مثبتی است
عدد صحیح (۲)

۳ $f(x) - x f(x) = x^2 - 3x + 2$
 $f(x) = f(x) - x f(x) = 9 - 4 + 2$
 $-f(x) = 2 \Rightarrow f(x) = -2$
 $f(-2) = f(-2) - 2 f(-2) = 2 + 4 + 2$
 $\Rightarrow f(-2) = 2 - 2 + 4 + 2 = 6$ ✓ (۲)

۴ $f(x) = \begin{cases} x - \sqrt{x+2} & x \geq 0 \\ 2x+2 & x \leq 0 \end{cases}$
 $f(0) = 0 - \sqrt{0+2} = -\sqrt{2}$
 $f(1) = 1 - \sqrt{1+2} = 1 - \sqrt{3}$
 $f(f(0)) = f(-\sqrt{2}) = 2(-\sqrt{2}) + 2 = -2\sqrt{2} + 2$
 $f(f(1)) = f(1 - \sqrt{3}) = 2(1 - \sqrt{3}) + 2 = 4 - 2\sqrt{3}$
 $f(f(0)) + f(f(1)) = -2\sqrt{2} + 2 + 4 - 2\sqrt{3} = 6 - 2\sqrt{2} - 2\sqrt{3}$ ✓ (۲)

۵ $f(x) = ax^2 + bx + c$ و $f(x-1) - f(x) = 4x + 2$
 $f(0) = c$
 $f(1) = a + b + c$
 $f(2) = 4a + 2b + c$
 $f(3) = 9a + 3b + c$
 $f(4) = 16a + 4b + c$
 $f(5) = 25a + 5b + c$
 $f(6) = 36a + 6b + c$
 $f(7) = 49a + 7b + c$
 $f(8) = 64a + 8b + c$
 $f(9) = 81a + 9b + c$
 $f(10) = 100a + 10b + c$
 $f(11) = 121a + 11b + c$
 $f(12) = 144a + 12b + c$
 $f(13) = 169a + 13b + c$
 $f(14) = 196a + 14b + c$
 $f(15) = 225a + 15b + c$
 $f(16) = 256a + 16b + c$
 $f(17) = 289a + 17b + c$
 $f(18) = 324a + 18b + c$
 $f(19) = 361a + 19b + c$
 $f(20) = 400a + 20b + c$
 $f(21) = 441a + 21b + c$
 $f(22) = 484a + 22b + c$
 $f(23) = 529a + 23b + c$
 $f(24) = 576a + 24b + c$
 $f(25) = 625a + 25b + c$
 $f(26) = 676a + 26b + c$
 $f(27) = 729a + 27b + c$
 $f(28) = 784a + 28b + c$
 $f(29) = 841a + 29b + c$
 $f(30) = 900a + 30b + c$
 $f(31) = 961a + 31b + c$
 $f(32) = 1024a + 32b + c$
 $f(33) = 1089a + 33b + c$
 $f(34) = 1156a + 34b + c$
 $f(35) = 1225a + 35b + c$
 $f(36) = 1296a + 36b + c$
 $f(37) = 1369a + 37b + c$
 $f(38) = 1444a + 38b + c$
 $f(39) = 1521a + 39b + c$
 $f(40) = 1600a + 40b + c$
 $f(41) = 1681a + 41b + c$
 $f(42) = 1764a + 42b + c$
 $f(43) = 1849a + 43b + c$
 $f(44) = 1936a + 44b + c$
 $f(45) = 2025a + 45b + c$
 $f(46) = 2116a + 46b + c$
 $f(47) = 2209a + 47b + c$
 $f(48) = 2304a + 48b + c$
 $f(49) = 2401a + 49b + c$
 $f(50) = 2500a + 50b + c$
 $f(51) = 2601a + 51b + c$
 $f(52) = 2704a + 52b + c$
 $f(53) = 2809a + 53b + c$
 $f(54) = 2916a + 54b + c$
 $f(55) = 3025a + 55b + c$
 $f(56) = 3136a + 56b + c$
 $f(57) = 3249a + 57b + c$
 $f(58) = 3364a + 58b + c$
 $f(59) = 3481a + 59b + c$
 $f(60) = 3600a + 60b + c$
 $f(61) = 3721a + 61b + c$
 $f(62) = 3844a + 62b + c$
 $f(63) = 3969a + 63b + c$
 $f(64) = 4096a + 64b + c$
 $f(65) = 4225a + 65b + c$
 $f(66) = 4356a + 66b + c$
 $f(67) = 4489a + 67b + c$
 $f(68) = 4624a + 68b + c$
 $f(69) = 4761a + 69b + c$
 $f(70) = 4900a + 70b + c$
 $f(71) = 5041a + 71b + c$
 $f(72) = 5184a + 72b + c$
 $f(73) = 5329a + 73b + c$
 $f(74) = 5476a + 74b + c$
 $f(75) = 5625a + 75b + c$
 $f(76) = 5776a + 76b + c$
 $f(77) = 5929a + 77b + c$
 $f(78) = 6084a + 78b + c$
 $f(79) = 6241a + 79b + c$
 $f(80) = 6400a + 80b + c$
 $f(81) = 6561a + 81b + c$
 $f(82) = 6724a + 82b + c$
 $f(83) = 6889a + 83b + c$
 $f(84) = 7056a + 84b + c$
 $f(85) = 7225a + 85b + c$
 $f(86) = 7396a + 86b + c$
 $f(87) = 7569a + 87b + c$
 $f(88) = 7744a + 88b + c$
 $f(89) = 7921a + 89b + c$
 $f(90) = 8100a + 90b + c$
 $f(91) = 8281a + 91b + c$
 $f(92) = 8464a + 92b + c$
 $f(93) = 8649a + 93b + c$
 $f(94) = 8836a + 94b + c$
 $f(95) = 9025a + 95b + c$
 $f(96) = 9216a + 96b + c$
 $f(97) = 9409a + 97b + c$
 $f(98) = 9604a + 98b + c$
 $f(99) = 9801a + 99b + c$
 $f(100) = 10000a + 100b + c$
 $f(101) = 10201a + 101b + c$
 $f(102) = 10404a + 102b + c$
 $f(103) = 10609a + 103b + c$
 $f(104) = 10816a + 104b + c$
 $f(105) = 11025a + 105b + c$
 $f(106) = 11236a + 106b + c$
 $f(107) = 11449a + 107b + c$
 $f(108) = 11664a + 108b + c$
 $f(109) = 11881a + 109b + c$
 $f(110) = 12100a + 110b + c$
 $f(111) = 12321a + 111b + c$
 $f(112) = 12544a + 112b + c$
 $f(113) = 12769a + 113b + c$
 $f(114) = 12996a + 114b + c$
 $f(115) = 13225a + 115b + c$
 $f(116) = 13456a + 116b + c$
 $f(117) = 13689a + 117b + c$
 $f(118) = 13924a + 118b + c$
 $f(119) = 14161a + 119b + c$
 $f(120) = 14400a + 120b + c$
 $f(121) = 14641a + 121b + c$
 $f(122) = 14884a + 122b + c$
 $f(123) = 15129a + 123b + c$
 $f(124) = 15376a + 124b + c$
 $f(125) = 15625a + 125b + c$
 $f(126) = 15876a + 126b + c$
 $f(127) = 16129a + 127b + c$
 $f(128) = 16384a + 128b + c$
 $f(129) = 16641a + 129b + c$
 $f(130) = 16900a + 130b + c$
 $f(131) = 17161a + 131b + c$
 $f(132) = 17424a + 132b + c$
 $f(133) = 17689a + 133b + c$
 $f(134) = 17956a + 134b + c$
 $f(135) = 18225a + 135b + c$
 $f(136) = 18496a + 136b + c$
 $f(137) = 18769a + 137b + c$
 $f(138) = 19044a + 138b + c$
 $f(139) = 19321a + 139b + c$
 $f(140) = 19600a + 140b + c$
 $f(141) = 19881a + 141b + c$
 $f(142) = 20164a + 142b + c$
 $f(143) = 20449a + 143b + c$
 $f(144) = 20736a + 144b + c$
 $f(145) = 21025a + 145b + c$
 $f(146) = 21316a + 146b + c$
 $f(147) = 21609a + 147b + c$
 $f(148) = 21904a + 148b + c$
 $f(149) = 22201a + 149b + c$
 $f(150) = 22500a + 150b + c$
 $f(151) = 22801a + 151b + c$
 $f(152) = 23104a + 152b + c$
 $f(153) = 23409a + 153b + c$
 $f(154) = 23716a + 154b + c$
 $f(155) = 24025a + 155b + c$
 $f(156) = 24336a + 156b + c$
 $f(157) = 24649a + 157b + c$
 $f(158) = 24964a + 158b + c$
 $f(159) = 25281a + 159b + c$
 $f(160) = 25600a + 160b + c$
 $f(161) = 25921a + 161b + c$
 $f(162) = 26244a + 162b + c$
 $f(163) = 26569a + 163b + c$
 $f(164) = 26896a + 164b + c$
 $f(165) = 27225a + 165b + c$
 $f(166) = 27556a + 166b + c$
 $f(167) = 27889a + 167b + c$
 $f(168) = 28224a + 168b + c$
 $f(169) = 28561a + 169b + c$
 $f(170) = 28900a + 170b + c$
 $f(171) = 29241a + 171b + c$
 $f(172) = 29584a + 172b + c$
 $f(173) = 29929a + 173b + c$
 $f(174) = 30276a + 174b + c$
 $f(175) = 30625a + 175b + c$
 $f(176) = 30976a + 176b + c$
 $f(177) = 31329a + 177b + c$
 $f(178) = 31684a + 178b + c$
 $f(179) = 32041a + 179b + c$
 $f(180) = 32400a + 180b + c$
 $f(181) = 32761a + 181b + c$
 $f(182) = 33124a + 182b + c$
 $f(183) = 33489a + 183b + c$
 $f(184) = 33856a + 184b + c$
 $f(185) = 34225a + 185b + c$
 $f(186) = 34596a + 186b + c$
 $f(187) = 34969a + 187b + c$
 $f(188) = 35344a + 188b + c$
 $f(189) = 35721a + 189b + c$
 $f(190) = 36100a + 190b + c$
 $f(191) = 36481a + 191b + c$
 $f(192) = 36864a + 192b + c$
 $f(193) = 37249a + 193b + c$
 $f(194) = 37636a + 194b + c$
 $f(195) = 38025a + 195b + c$
 $f(196) = 38416a + 196b + c$
 $f(197) = 38809a + 197b + c$
 $f(198) = 39204a + 198b + c$
 $f(199) = 39601a + 199b + c$
 $f(200) = 40000a + 200b + c$
 $f(201) = 40401a + 201b + c$
 $f(202) = 40804a + 202b + c$
 $f(203) = 41209a + 203b + c$
 $f(204) = 41616a + 204b + c$
 $f(205) = 42025a + 205b + c$
 $f(206) = 42436a + 206b + c$
 $f(207) = 42849a + 207b + c$
 $f(208) = 43264a + 208b + c$
 $f(209) = 43681a + 209b + c$
 $f(210) = 44100a + 210b + c$
 $f(211) = 44521a + 211b + c$
 $f(212) = 44944a + 212b + c$
 $f(213) = 45369a + 213b + c$
 $f(214) = 45796a + 214b + c$
 $f(215) = 46225a + 215b + c$
 $f(216) = 46656a + 216b + c$
 $f(217) = 47089a + 217b + c$
 $f(218) = 47524a + 218b + c$
 $f(219) = 47961a + 219b + c$
 $f(220) = 48400a + 220b + c$
 $f(221) = 48841a + 221b + c$
 $f(222) = 49284a + 222b + c$
 $f(223) = 49729a + 223b + c$
 $f(224) = 50176a + 224b + c$
 $f(225) = 50625a + 225b + c$
 $f(226) = 51076a + 226b + c$
 $f(227) = 51529a + 227b + c$
 $f(228) = 51984a + 228b + c$
 $f(229) = 52441a + 229b + c$
 $f(230) = 52900a + 230b + c$
 $f(231) = 53361a + 231b + c$
 $f(232) = 53824a + 232b + c$
 $f(233) = 54289a + 233b + c$
 $f(234) = 54756a + 234b + c$
 $f(235) = 55225a + 235b + c$
 $f(236) = 55696a + 236b + c$
 $f(237) = 56169a + 237b + c$
 $f(238) = 56644a + 238b + c$
 $f(239) = 57121a + 239b + c$
 $f(240) = 57600a + 240b + c$
 $f(241) = 58081a + 241b + c$
 $f(242) = 58564a + 242b + c$
 $f(243) = 59049a + 243b + c$
 $f(244) = 59536a + 244b + c$
 $f(245) = 60025a + 245b + c$
 $f(246) = 60516a + 246b + c$
 $f(247) = 61009a + 247b + c$
 $f(248) = 61504a + 248b + c$
 $f(249) = 62001a + 249b + c$
 $f(250) = 62500a + 250b + c$
 $f(251) = 63001a + 251b + c$
 $f(252) = 63504a + 252b + c$
 $f(253) = 64009a + 253b + c$
 $f(254) = 64516a + 254b + c$
 $f(255) = 65025a + 255b + c$
 $f(256) = 65536a + 256b + c$
 $f(257) = 66049a + 257b + c$
 $f(258) = 66564a + 258b + c$
 $f(259) = 67081a + 259b + c$
 $f(260) = 67600a + 260b + c$
 $f(261) = 68121a + 261b + c$
 $f(262) = 68644a + 262b + c$
 $f(263) = 69169a + 263b + c$
 $f(264) = 69696a + 264b + c$
 $f(265) = 70225a + 265b + c$
 $f(266) = 70756a + 266b + c$
 $f(267) = 71289a + 267b + c$
 $f(268) = 71824a + 268b + c$
 $f(269) = 72361a + 269b + c$
 $f(270) = 72900a + 270b + c$
 $f(271) = 73441a + 271b + c$
 $f(272) = 73984a + 272b + c$
 $f(273) = 74529a + 273b + c$
 $f(274) = 75076a + 274b + c$
 $f(275) = 75625a + 275b + c$
 $f(276) = 76176a + 276b + c$
 $f(277) = 76729a + 277b + c$
 $f(278) = 77284a + 278b + c$
 $f(279) = 77841a + 279b + c$
 $f(280) = 78400a + 280b + c$
 $f(281) = 78961a + 281b + c$
 $f(282) = 79524a + 282b + c$
 $f(283) = 80089a + 283b + c$
 $f(284) = 80656a + 284b + c$
 $f(285) = 81225a + 285b + c$
 $f(286) = 81796a + 286b + c$
 $f(287) = 82369a + 287b + c$
 $f(288) = 82944a + 288b + c$
 $f(289) = 83521a + 289b + c$
 $f(290) = 84100a + 290b + c$
 $f(291) = 84681a + 291b + c$
 $f(292) = 85264a + 292b + c$
 $f(293) = 85849a + 293b + c$
 $f(294) = 86436a + 294b + c$
 $f(295) = 87025a + 295b + c$
 $f(296) = 87616a + 296b + c$
 $f(297) = 88209a + 297b + c$
 $f(298) = 88804a + 298b + c$
 $f(299) = 89401a + 299b + c$
 $f(300) = 90000a + 300b + c$
 $f(301) = 90601a + 301b + c$
 $f(302) = 91204a + 302b + c$
 $f(303) = 91809a + 303b + c$
 $f(304) = 92416a + 304b + c$
 $f(305) = 93025a + 305b + c$
 $f(306) = 93636a + 306b + c$
 $f(307) = 94249a + 307b + c$
 $f(308) = 94864a + 308b + c$
 $f(309) = 95481a + 309b + c$
 $f(310) = 96100a + 310b + c$
 $f(311) = 96721a + 311b + c$
 $f(312) = 97344a + 312b + c$
 $f(313) = 97969a + 313b + c$
 $f(314) = 98596a + 314b + c$
 $f(315) = 99225a + 315b + c$
 $f(316) = 99856a + 316b + c$
 $f(317) = 100489a + 317b + c$
 $f(318) = 101124a + 318b + c$
 $f(319) = 101761a + 319b + c$
 $f(320) = 102400a + 320b + c$
 $f(321) = 103041a + 321b + c$
 $f(322) = 103684a + 322b + c$
 $f(323) = 104329a + 323b + c$
 $f(324) = 104976a + 324b + c$
 $f(325) = 105625a + 325b + c$
 $f(326) = 106276a + 326b + c$
 $f(327) = 106929a + 327b + c$
 $f(328) = 107584a + 328b + c$
 $f(329) = 108241a + 329b + c$
 $f(330) = 108900a + 330b + c$
 $f(331) = 109561a + 331b + c$
 $f(332) = 110224a + 332b + c$
 $f(333) = 110889a + 333b + c$
 $f(334) = 111556a + 334b + c$
 $f(335) = 112225a + 335b + c$
 $f(336) = 112896a + 336b + c$
 $f(337) = 113569a + 337b + c$
 $f(338) = 114244a + 338b + c$
 $f(339) = 114921a + 339b + c$
 $f(340) = 115600a + 340b + c$
 $f(341) = 116281a + 341b + c$
 $f(342) = 116964a + 342b + c$
 $f(343) = 117649a + 343b + c$
 $f(344) = 118336a + 344b + c$
 $f(345) = 119025a + 345b + c$
 $f(346) = 119716a + 346b + c$
 $f(347) = 120409a + 347b + c$
 $f(348) = 121104a + 348b + c$
 $f(349) = 121801a + 349b + c$
 $f(350) = 122500a + 350b + c$
 $f(351) = 123201a + 351b + c$
 $f(352) = 123904a + 352b + c$
 $f(353) = 124609a + 353b + c$
 $f(354) = 125316a + 354b + c$
 $f(355) = 126025a + 355b + c$
 $f(356) = 126736a + 356b + c$
 $f(357) = 127449a + 357b + c$
 $f(358) = 128164a + 358b + c$
 $f(359) = 128881a + 359b + c$
 $f(360) = 129600a + 360b + c$
 $f(361) = 130321a + 361b + c$
 $f(362) = 131044a + 362b + c$
 $f(363) = 131769a + 363b + c$
 $f(364) = 132496a + 364b + c$
 $f(365) = 133225a + 365b + c$
 $f(366) = 133956a + 366b + c$
 $f(367) = 134689a + 367b + c$
 $f(368) = 135424a + 368b + c$
 $f(369) = 136161a + 369b + c$
 $f(370) = 136900a + 370b + c$
 $f(371) = 137641a + 371b + c$
 $f(372) = 138384a + 372b + c$
 $f(373) = 139129a + 373b + c$
 $f(374) = 139876a + 374b + c$
 $f(375) = 140625a + 375b + c$
 $f(376) = 141376a + 376b + c$
 $f(377) = 142129a + 377b + c$
 $f(378) = 142884a + 378b + c$
 $f(379) = 143641a + 379b + c$
 $f(380) = 144400a + 380b + c$
 $f(381) = 145161a + 381b + c$
 $f(382) = 145924a + 382b + c$
 $f(383) = 146689a + 383b + c$
 $f(384) = 147456a + 384b + c$
 $f(385) = 148225a + 385b + c$
 $f(386) = 148996a + 386b + c$
 $f(387) = 149769a + 387b + c$
 $f(388) = 150544a + 388b + c$
 $f(389) = 151321a + 389b + c$
 $f(390) = 152100a + 390b + c$
 $f(391) = 152881a + 391b + c$
 $f(392) = 153664a + 392b + c$
 $f(393) = 154449a + 393b + c$
 $f(394) = 155236a + 394b + c$
 $f(395) = 156025a + 395b + c$
 $f(396) = 156816a + 396b + c$
 $f(397) = 157609a + 397b + c$
 $f(398) = 158404a + 398b + c$
 $f(399) = 159201a + 399b + c$
 $f(400) = 160000a + 400b + c$
 $f(401) = 160801a + 401b + c$
 $f(402) = 161604a + 402b + c$
 $f(403) = 162409a + 403b + c$
 $f(404) = 163216a + 404b + c$
 $f(405) = 164025a + 405b + c$
 $f(406) = 164836a + 406b + c$
 $f(407) = 165649a + 407b + c$
 $f(408) = 166464a + 408b + c$
 $f(409) = 167281a + 409b + c$
 $f(410) = 168100a + 410b + c$
 $f(411) = 168921a + 411b + c$
 $f(412) = 169744a + 412b + c$
 $f(413) = 170569a + 413b + c$
 $f(414) = 171396a + 414b + c$
 $f(415) = 172225a + 415b + c$
 $f(416) = 173056a + 416b + c$
 $f(417) = 1$

$$f(x) = \frac{(x+2)^2 + 1}{(x+2)^2 + 2} \Rightarrow f(\sqrt{x}-2) = \frac{(\sqrt{x})^2 + 1}{(\sqrt{x})^2 + 2} = \frac{x}{x+2} \quad \left(\frac{x}{x+2} \right)$$

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$$f\left(x - \frac{1}{x}\right) = \frac{x^2 + 1}{x^2} \Rightarrow f\left(x - \frac{1}{x}\right) = \frac{x^2}{x^2} + \frac{1}{x^2} = x^2 + \frac{1}{x^2}$$

$$\Rightarrow f\left(x - \frac{1}{x}\right) = \left(x - \frac{1}{x}\right)^2 + 2$$

$$\Rightarrow f(-2) = (-2)^2 + 2 = 6$$

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الف، $\frac{f}{g} = \left\{ \left(2, \frac{0}{\sqrt{2}}\right), \left(1, \frac{-\sqrt{2}}{\sqrt{2}}\right), \left(0, \frac{2}{\sqrt{2}}\right) \right\}$

ب، $\frac{f}{g} = \left\{ \left(2, \frac{\sqrt{2}}{2}\right), \left(1, \frac{-\sqrt{2}}{2}\right), \left(0, \frac{\sqrt{2}}{2}\right) \right\}$

٨

الف، $f(x) = \{ (2, 2), (3, 8), (-5, 4), (1, -4) \}$

ب، $f(x) + 1 = \{ (2, 3), (3, 9), (-5, 5), (1, -3) \}$

ج، $\{ (2, 4), (3, 12), (-5, 13), (1, 13) \} = 3f'(x) + 1$

د، $\{ (1, 1), \left(\frac{3}{2}, 4\right), \left(-\frac{5}{2}, 2\right), \left(\frac{1}{2}, -2\right) \} = f(x/2)$

٩

الف، $f - g = \{ (2, 2), (1, 4), (3, 2) \}$

ب، $\frac{2f}{g} = 2f = \{ (2, 4), (7, 8), (1, 8), (4, 4), (5, 4) \}$

ج، $\{ (1, \frac{4}{3}), (2, \frac{4}{3}), (3, -2) \}$

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