

## Math 104 – Problems for the gateway exam

1. Evaluate the function  $f(x) = 3x^2 - 2x + 1$  for  $x = 3$ .
2. Evaluate the function  $g(t) = 2t^2 - 2$  for  $t = a + h$ .
3. Evaluate the function  $f(y) = \frac{6y - 1}{y}$  for  $y = c + 1$ .
4. Evaluate the function  $f(x) = x^2 - 6x$  for  $x = b - 1$ .
5. Evaluate the function  $v(t) = 3t + 2$  for  $t = a + h$ .
6. Evaluate the function  $h(s) = 3 - s - \frac{1}{2}s^2$  for  $s = j - 2$ .
7. Evaluate the function  $f(x) = 2x^2 - 5$  for  $x = -1$ .
8. Evaluate the function  $g(t) = 8t - 3$  for  $t = d - 2$ .
9. Evaluate the function  $f(y) = \frac{y + 2}{y - 2}$  for  $y = m + k$ .
10. Evaluate the function  $f(x) = 9x + 1$  for  $x = t + 2$ .
11. Solve  $P = S - Srt$  for  $r$ .
12. Solve  $2rx + 7 = 8(r - x)$  for  $x$ .
13. Solve  $\frac{1}{f} = \frac{1}{d_0} + \frac{1}{d_1}$  for  $f$ .
14. Solve  $2ax - 3d = b(x - a)$  for  $x$ .
15. Solve  $v = \frac{v_1 + v_2}{1 + \frac{v_1 v_2}{c^2}}$  for  $v_1$ .
16. Solve  $x + y = \sqrt{x^2 + y^2 + 1}$  for  $y$ .
17. Solve  $\frac{1}{x} + \frac{1}{y} = 1$  for  $y$ .
18. Solve  $Q_w = m_w c_w (T_f - T_w)$  for  $T_w$ .

19. Solve  $y - y_1 = m(x - x_1)$  for  $x$ .
20. Solve  $\frac{x}{a} + \frac{y}{b} = 1$  for  $x$ .
21. Solve  $x^{\frac{1}{3}} - 2x^{\frac{1}{6}} - 15 = 0$  for  $x$ .
22. Solve  $(2x - 5)^3 - (2x - 5) = 0$  for  $x$ .
23. Solve  $-14x^{\frac{1}{2}} = x + 49$  for  $x$ .
24. Solve  $(x + 4)^3 = 125$  for  $x$ .
25. Solve  $t^{\frac{7}{2}} - 4t^{\frac{5}{2}} = -4t^{\frac{3}{2}}$  for  $t$ .
26. Solve  $(x - 5)^3 - 27 = 0$  for  $x$ .
27. Solve  $(h - 1)^{\frac{1}{3}} + 4(h - 1)^{\frac{1}{6}} + 3 = 0$  for  $h$ .
28. Solve  $2p^{\frac{1}{2}} = 24$  for  $p$ .
29. Solve  $12q - 21q^2 - 6q^3 = 0$  for  $q$ .
30. Solve  $8z^{\frac{1}{2}} + 14z^{\frac{3}{2}} - 15z^{\frac{5}{2}} = 0$  for  $z$ .
31. Solve  $\sqrt{x - 4} - 6 = 0$  for  $x$ .
32. Solve  $\sqrt{6 - y} + \sqrt{5y + 6} = 6$  for  $y$ .
33. Solve  $b = \sqrt{12b - 35}$  for  $b$ .
34. Solve  $c = 3 + \sqrt{3 - c}$  for  $c$ .
35. Solve  $\sqrt{2x + 11} - \sqrt{2x - 5} = 2$  for  $x$ .
36. Solve  $\sqrt{m + 7} + \sqrt{m - 5} = 6$  for  $m$ .
37. Solve  $2x = \sqrt{4x + 15}$  for  $x$ .
38. Solve  $\sqrt{10 - t} = 4$  for  $t$ .
39. Solve  $r = \sqrt{5 - r} + 5$  for  $r$ .
40. Solve  $\sqrt{x - 7} + 11 = 12$  for  $x$ .
41. Solve  $a^4 - 9a^2 = -14$  for  $a$ .
42. Solve  $2x^4 - 11x^2 + 12 = 0$  for  $x$ .
43. Solve  $(\frac{g - 1}{g})^2 - 10(\frac{g - 1}{g}) + 9 = 0$  for  $g$ .

44. Solve  $6u^4 - 7u^2 + 2 = 0$  for  $u$ .
45. Solve  $9x^4 = 30x^2 - 25$  for  $x$ .
46. Solve  $(\frac{f+2}{f})^2 - 3(\frac{f+2}{f}) + 2 = 0$  for  $f$ .
47. Solve  $6(\frac{x+4}{x})^2 + 5(\frac{x+4}{x}) + 1 = 0$  for  $x$ .
48. Solve  $x^4 - 8x^2 + 12 = 0$  for  $x$ .
49. Solve  $4(\frac{g}{g+1})^2 - 4(\frac{g}{g+1}) + 1 = 0$  for  $g$ .
50. Solve  $2(\frac{x}{x-1})^2 - 5(\frac{x}{x-1}) - 3 = 0$  for  $x$ .
51. Solve  $e^{3x}e^{3x} = (e^x)^xe^{-7}$  for  $x$ .
52. Solve  $2^{5t+1} = 2^{t^2+7}$  for  $t$ .
53. Solve  $7^{4r+4} = 7^{r^2}7^8$  for  $r$ .
54. Solve  $\ln(3x - 5) = \ln 11 + \ln 2$  for  $x$ .
55. Solve  $\ln(x + 9) - \ln(x) = 1$  for  $x$ .
56. Solve  $(e^{2m})^{4m} = e^{3-2m}$  for  $m$ .
57. Solve  $\ln(4p) + \ln(p + \frac{7}{4}) = \ln 2$  for  $p$ .
58. Solve  $(5^{5x})^x = (5^{25})^x$  for  $x$ .
59. Solve  $\ln x = \ln 8 - 2 \ln x$  for  $x$ .
60. Solve  $\ln(3x) + \ln(x - \frac{2}{3}) = \frac{1}{2} \ln 64$  for  $x$ .
61. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $(f - g)(4)$ .
62. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $(\frac{g}{f})(a)$ .
63. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $3g(c)$ .
64. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $f(g(a + h))$ .
65. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $(f + g)(x)$ .
66. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $2f(1)$ .

67. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $g(f(x + y))$ .
68. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $(gf)(x)$ .
69. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $g(f(\sqrt{2}))$ .
70. Given  $f(x) = x^2 + 2$  and  $g(x) = \sqrt{x} - 2$ , find the value of  $(g - f)(9)$ .
71. Given  $f(x) = 3x - 2$  and  $g(x) = x + 1$ , find  $f(g(x))$ .
72. Given  $g(x) = \frac{1}{x + 3}$  and  $f(x) = \sqrt{x}$ , find  $f(g(x))$ .
73. Given  $g(x) = \frac{x - 1}{x + 1}$  and  $f(x) = x^2$ , find  $f(g(x))$ .
74. Given  $f(x) = x^2 + 4x - 5$  and  $g(x) = x - c$ , find  $f(g(x))$ .
75. Given  $g(x) = \sqrt{x^2 - 5x}$  and  $f(x) = x^2 + 1$ , find  $f(g(x))$ .
76. Given  $g(x) = \frac{3}{x} - x$  and  $f(x) = \frac{x}{3} + x$ , find  $f(g(x))$ .
77. Given  $f(x) = x^{\frac{1}{3}} + x^{\frac{1}{2}}$  and  $g(x) = x^3$ , find  $f(g(x))$ .
78. Given  $f(x) = 5x^2 - 3x^{\frac{1}{2}}$  and  $g(x) = x^4$ , find  $f(g(x))$ .
79. Given  $f(x) = 9x + \frac{2}{x - 1}$  and  $g(x) = 1 + 2x$ , find  $f(g(x))$ .
80. Given  $g(x) = 5x^2 - 2$  and  $f(x) = \sqrt{x} + 1$ , find  $f(g(x))$ .
81. Find the inverse function of  $g(t) = \frac{1}{t - 1}$ .
82. Find the inverse function of  $f(x) = \sqrt{3x + 4}$ .
83. Find the inverse function of  $v(t) = \frac{t + 3}{t - 2}$ .
84. Find the inverse function of  $u(t) = \frac{4}{\sqrt{3t}}$ .
85. Find the inverse function of  $g(y) = \sqrt{y} + 1$ .
86. Find the inverse function of  $f(x) = \frac{1}{2x + 1}$ .
87. Find the inverse function of  $m(t) = \frac{4t + 5}{2t}$ .

88. Find the inverse function of  $y(x) = \frac{x^3 - 1}{x^3 + 5}$ .
89. Find the inverse function of  $f(s) = \frac{-3}{2s + 5}$ .
90. Find the inverse function of  $u(r) = 5 + \sqrt{3r - 2}$ .
91. Simplify as much as possible  $\frac{(x^2 + 1)(x - 1)^2}{x^4 - 1}$ .
92. Simplify as much as possible  $\frac{2}{x + 1} + \frac{2}{x - 1} + \frac{1}{x^2 - 1}$ .
93. Simplify as much as possible  $\sqrt{2x - 1} - \frac{x + 2}{\sqrt{2x - 1}}$ .
94. Simplify as much as possible  $\frac{xy + zy}{x^2 + 2xz + z^2}$ .
95. Simplify as much as possible  $\frac{x^2 + xy}{x^2 + xy - 2x - 2y}$ .
96. Simplify as much as possible  $\frac{2x^3 - 6x^2 + x - 3}{x - 3}$ .
97. Simplify as much as possible  $\frac{x^3 + 5x^2 + 6x}{x^3 - 4x}$ .
98. Simplify as much as possible  $\frac{x}{x + y} - \frac{y}{x}$ .
99. Simplify as much as possible  $\frac{x + h}{x + h + 1} - \frac{x}{x + 1}$ .
100. Simplify as much as possible  $\frac{-1}{x} + \frac{2}{x^2 + 1} + \frac{1}{x^3 + x}$ .