MA 131/135: College Algebra
Final Exam Review Solutions

These solutions show the necessary work for the problems that require a certain level of written work. All answers are included in the review packet, so if a solution is not included here, you are expected to be able to do the problems without having to write much.

3. $5x - 3 = 0$

$5x = 3$

$x = 3/5$

$6(3/5) + 1 = \frac{28}{5} \neq 0.$

So, $\boxed{x = 3/5}$

4. Do not use the method suggested in the problem. (It doesn't help.) Instead, find the x-intercepts analytically.

$y = x^2 + 1.5x + 0.52$

$x = \frac{-1.5}{2} \pm \frac{\sqrt{1.5^2 - 4(0.52)}}{2}$

$= -0.75 \pm \frac{\sqrt{0.01}}{2}$

$= -0.75 \pm \frac{0.1}{2}$

$= -0.75 \pm 0.05$

$= -0.7, -0.8$

So, the x-intercepts are $(-0.7, 0)$ and $(-0.8, 0)$.

Choose a "window" accordingly:

For example: x-min: -0.9

x-max: -0.6

y-min: -0.1

y-max: $+0.1$

6. Find the line passing through $(0, 15000)$ and $(5, 47000)$.

$m = \frac{47000-15000}{5-0} = \frac{32000}{5} = 6400$

$(0, 15000)$ is the y-intercept, so $\boxed{y = 6400x + 15000}$.

7. Doubling Time: $T = \frac{\ln 2}{r} = \frac{\ln 2}{0.07} \approx 10$ yrs.

8. $h(t) = -10t^2 + 240t$ Find the vertex.

$= -10(t^2 - 24t + 144) + 1440$

$= -10(t-12)^2 + 1440$

Vertex is $(12, 1440)$ $\longrightarrow$ 12s; 1440 ft.

10. $|3x+6| - 2 = 7$

$|3x+6| = 9$

$3x+6 = 9$ $\qquad$ $3x+6 = -9$

$3x = 3$ $\qquad$ $3x = -15$

$x = 1$ $\qquad$ $x = -5$

11. $4^{9-3x} = 64$

$4^{9-3x} = 4^3$

$9-3x = 3$

$3x = 6$

$x = 2.$

12. $e^{5x-1} = (e^3)^{-x}$

$e^{5x-1} = e^{-3x}$

$5x-1 = -3x$

$8x = 1$

$x = 1/8$

15. $y = \frac{5x-4}{7}$

$x = \frac{5y-4}{7}$

$7x = 5y - 4$

$7x + 4 = 5y$

$y = \frac{7x+4}{5}$

$\boxed{f^{-1}(x) = \frac{7x+4}{5}}$

16. $5000 = 2500\, e^{0.08t}$

$2 = e^{0.08t}$

$\ln 2 = 0.08t$

$t = \ln 2 / 0.09$

$t \approx 8.7$ yrs.

17. $-6x + 7y = 43$

$7y = 6x + 43$

$y = \frac{6}{7}x + \frac{43}{7}$

$m = 6/7$

$y - 7 = \frac{6}{7}(x+6)$

$y = \frac{6}{7}x + \frac{36}{7} + \frac{49}{7}$

$y = \frac{6}{7}x + \frac{85}{7}$

18. $-7x + 3y = -58$

$3y = 7x - 58$

$y = \frac{7}{3}x - \frac{58}{3}$

$m = -3/7$

$y = -\frac{3}{7}(x-7) + 3$

$y = -\frac{3}{7}x + 3 + 3$

$y = -3/7\, x + 6$

19. $(fg)(x) = f(x) \cdot g(x)$

$= (9x-3)(2x+8)$

$= 18x^2 + 66x - 24$

20. $(f \circ g)(x) = f(g(x))$

$= \sqrt{(8x-7)+3}$

$= \sqrt{8x-4}$

$= \sqrt{4(2x-1)}$

$= \sqrt{4}\sqrt{2x-1}$

$= 2\sqrt{2x-1}$

21. $7(4) = 28$

$t = 3$? No.

$t = \frac{-3}{14} \pm \frac{\sqrt{9 - 4(7)(4)}}{14}$

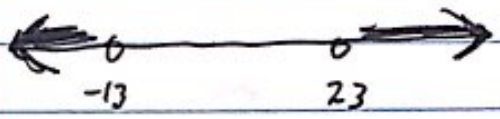
$= \frac{-3}{14} \pm \frac{\sqrt{-103}}{14}$

$= \frac{-3 \pm i\sqrt{103}}{14}$

23. $|x-5| > 18$

$x-5 \neq 18$ $\quad$ $x-5 \neq -18$

$x \neq 23$ $\quad$ $x \neq -13$



$(-\infty, -13) \cup (23, \infty)$

25. $\ln(5x-4) = \ln\left(\frac{8}{x-2}\right)$

$5x-4 = \frac{8}{x-2}$

$(5x-4)(x-2) = 8$

$5x^2 - 14x + 8 = 8$

$x(5x-14) = 0$

$x \neq 0$ $\quad$ $x = \frac{14}{5}$

26. $x+18 = 10^0$

$x+18 = 1$

$x = -17$

27. $\log_9\left((x-5)^2\right) = 1$

$2\log_9(x-5) = 1$

$\log_9(x-5) = \frac{1}{2}$

$x-5 = \sqrt{9}$

$x-5 = 3$

$\boxed{x = 8}$

29. Minimum: $f(x) = (x^2+12x+36)+32-36$

$= (x+6)^2 - 4$

Minimum value is $f(-6) = \boxed{-4}$

30. $\frac{x-3}{x+7} = -2$

$x-3 = -2x-14$

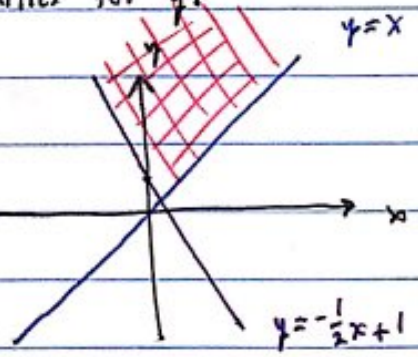
$3x = -11$

$x = -\frac{11}{3}$ ✓

31. Solve both inequalities for y:

$y \geq -\frac{1}{2}x + 1$

$y \geq x$



34. $\frac{-b}{2a} = \frac{19}{2(3)} = \frac{19}{6} = 3$

$P(3) = 3\cdot 3^2 - 19\cdot 3 + 31$

$= 27 - 57 + 31$

$= 4$

$V = (3, 4)$

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

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

$x = -3, -2$

$[-3, -2]$

36. $-1 \mid 2 \quad 3 \quad 4 \quad -10$

$\quad\quad\quad -2 \quad -1 \quad -3$

$\quad\quad 2 \quad 1 \quad 3 \quad \boxed{-13}$

$2x^2 + x + 3 + \frac{-13}{x+1}$ (B)

38. $f(x+h) = 4(x+h) - 12$

$= 4x + 4h - 12$

$f(x) = 4x - 12$

$f(x+h) - f(x) = 4h$

$DQ_f = \frac{f(x+h) - f(x)}{h} = \frac{4h}{h} = 4.$

39. $d = \sqrt{(-4-6)^2 + (4+3)^2} = \sqrt{100+49}$

$= \sqrt{149}$

$M = \left(\frac{-4+6}{2}, \frac{4-3}{2}\right) = \left(1, \frac{1}{2}\right).$

41. roots: $2, 6i, -6i$

$P(x) = (x-2)(x-6i)(x+6i)$

$= (x-2)(x^2+36)$

$\boxed{P(x) = x^3 - 2x^2 + 36x - 72}$

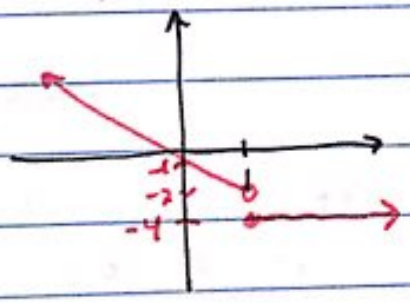
43. $x(x^2+5x-14) = 0$

$x(x+7)(x-2) = 0$

$x = 0, -7, 2.$

45. $\frac{3-9i}{5-7i} \cdot \frac{5+7i}{5+7i} = \frac{15 - 45i + 21i + 63}{25+49} = \frac{78 - 24i}{74} = \frac{39}{37} - \frac{12}{37}i$

47.



48. quarterly → $n=4$. Plug and chug.

49. $8 < \frac{3x-10}{3} < 13$

$24 < 3x - 10 < 39$

$34 < 3x < 49$

$\frac{34}{3} < x < \frac{49}{3}$

$\left(\frac{34}{3}, \frac{49}{3}\right)$

50. $(f+g)(4) = f(4) + g(4)$

$= (4-1) + (4+2)$

$= 3 + 6$

$= 9$

51. $9x + 8y = 36$

$2(-3x - 4y = -24)$ →

$9x + 8y = 36$

$-6x - 8y = -48$

$3x = -12$

$x = -4$

$-4y = -36$

$y = 9$

$(-4, 9)$

53. $\left(\sqrt{5x+6}\right)^2 = (2x-6)^2$

$5x + 6 = 4x^2 - 24x + 36$

$4x^2 - 29x + 30 = 0$

$4(30) = 120$

$-24 \cdot -5 = -29$

$4x^2 - 24x + -5x + 30 = 0$

$4x(x-6) - 5(x-6) = 0$

$(4x-5)(x-6) = 0$

$x = 5/4, \; x = 6$

55.

-3	2	-3	-4	19
		-6	27	-69
	2	-9	23	-50

$P(-3) = -50$

56. $5x - 3 = \log_3 14$

$5x = 3 + \log_3 14$

$x = \frac{1}{5}(3 + \log_3 14)$

57.

-2	5	7	119	175	-150
		-10	6	-250	150
	5	-3	125	-75	0

$(x+2)(5x^3 - 3x^2 + 125x - 75) = 0$

$(x+2)[x^2(5x-3) + 25(5x-3)] = 0$

$(x+2)(5x-3)(x^2+25) = 0$

$x = -2$

$x = 3/5$

$x = \pm 5i$

58. $y = x^3 - 2$ is one-to-one (Passes H-Line Test)

$x = y^3 - 2$

$y^3 = x + 2$

$y = \sqrt[3]{x+2}$

$f^{-1}(x) = \sqrt[3]{x+2}$