

Math 101 - Cumulative Review

1. (a) $f(-2) = 3$

(b) $g(0) = 2$

(c) $j(4) = \frac{1}{0}$ undefined

2. (a) $(f \circ h)(x) = \sqrt{\frac{4x - 14}{x - 2}}$

(b) $(f \circ h)(-1) = \sqrt{6}$

3. (a) $(g - h)(x) = x^2 + 2 - \frac{3x}{x - 2}$

(b) $(g - h)(4) = 12$

| Functions | Domain | Range |
|-----------|---|---------------------------------|
| f(x) | $(-\infty, 7]$ | $[0, \infty)$ |
| g(x) | all reals | $[2, \infty)$ |
| h(x) | $(-\infty, 2) \cup (2, \infty)$ | $(-\infty, 3) \cup (3, \infty)$ |
| j(x) | $(-\infty, 2) \cup (2, 4) \cup (4, \infty)$ | $(-\infty, 0) \cup (0, \infty)$ |

5. $h^{-1}(x) = \frac{2x}{x - 3}$

6a. $f^{-1}(x) = -x^2 + 7; x \geq 0$

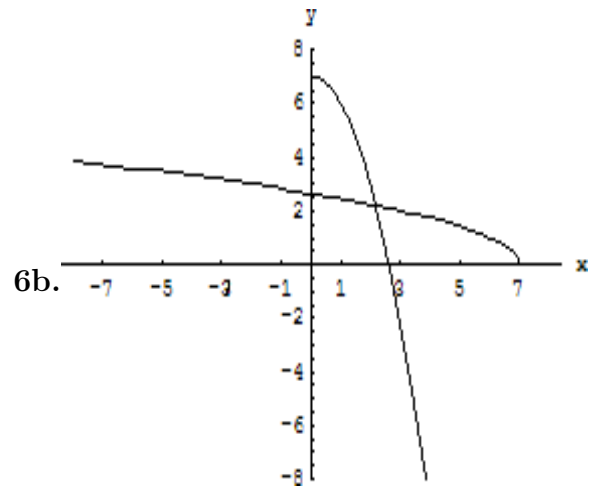


Fig. 1: $f(x)$ and $f^{-1}(x)$

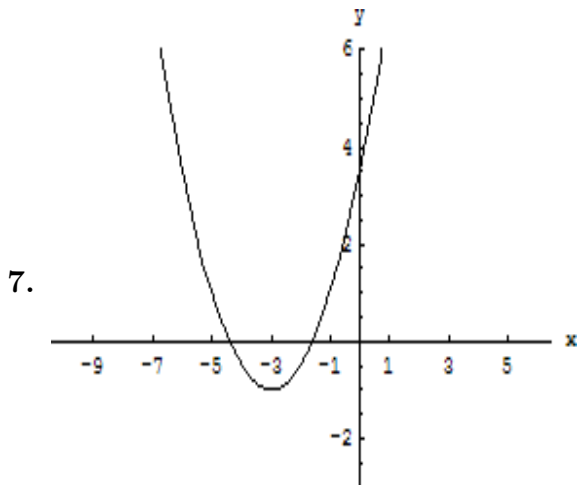


Fig. 2: $f(x) = .5(x + 3)^2 - 1$

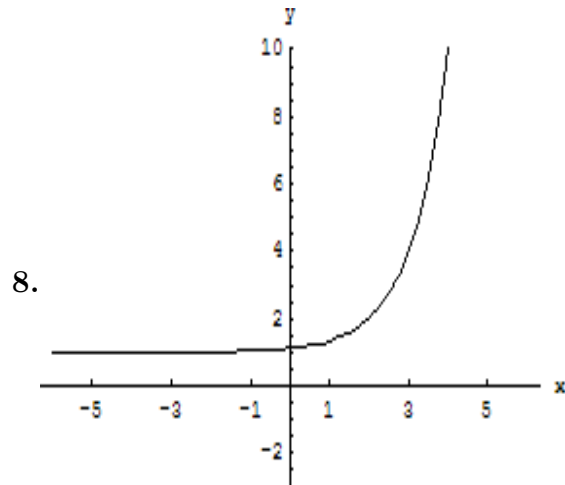


Fig. 3: $g(x) = 3^{x-2} + 1$

9. $\frac{3 \pm \sqrt{3}}{2}$

10. $5 \pm 2\sqrt{2}$

11. $1 \pm 2i$

12. $x = -4, x = 9$

13. $x = \sqrt{2}, x = -\sqrt{2}$ is extraneous

14. $x = 1$

15. $x = 1, x = -4$ is extraneous

16. $x = \ln \frac{5}{8}$

17. $x = \frac{-3}{\frac{2 \ln 7}{\ln 2} - 1}$, or $\frac{3 \ln 2}{\ln 2 - 2 \ln 7}$, $x \approx -.650095$

18. a) $\left(\frac{3}{2}, \frac{7}{2}\right)$ b) Center: $(-1, 2)$, radius: 5

19. $3 - 2x - h$

20. a) -6 b) $(3 + \sqrt{5}) + (3 - \sqrt{5})i$ c) $9 + i$

d) 53 e) $4 + 3i$

21. Maximum value: $\frac{5618}{7} = 802.571$ at $x = 535.714$

22. a) inc: $(-.76, .76)$; dec: $(-\infty, -.76) \cup (.76, \infty)$ b) 21 c) $\pm\{1, 3, \frac{1}{2}, \frac{1}{4}, \frac{3}{2}, \frac{3}{4}\}$,
 d) $-(x+1)(2x+1)(2x-3)$ e) $(-1, -\frac{1}{2}) \cup (\frac{3}{2}, \infty)$

23. $f(x) = 5x^4 - 3x^3 + 123x^2 - 75x - 50$

24. $x = -\frac{1}{5}, x = 1 + i\sqrt{5}, x = 1 - i\sqrt{5}$

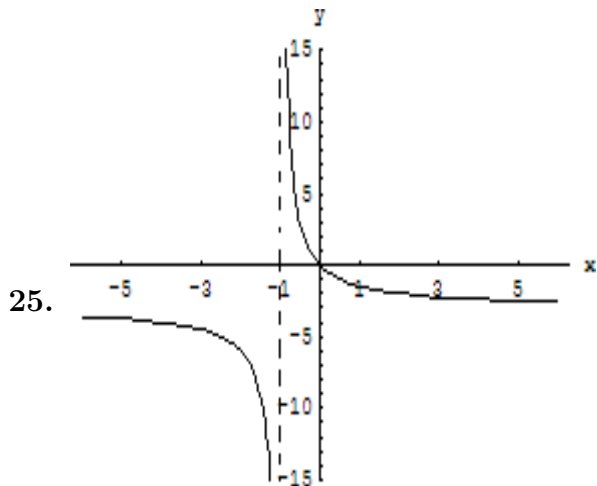


Fig. 4: x-int: $(0, 0)$, y-int: $(0, 0)$; VA: $x = -1$, HA: $y = -3, (-1, 0]$

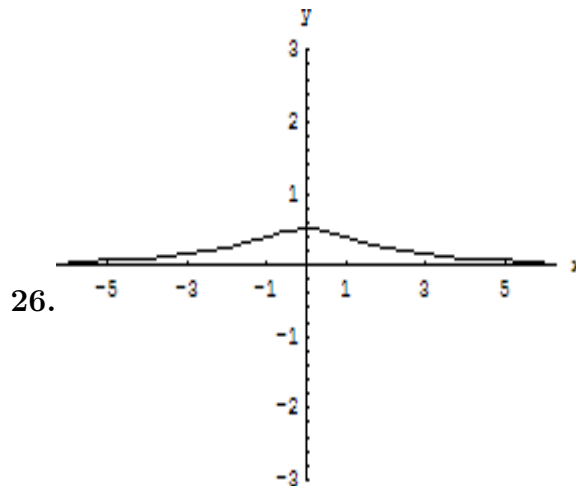


Fig. 5: x-int: none, y-int: $(0, 1/2)$; VA: none, HA: $y = 0, (-\infty, \infty)$

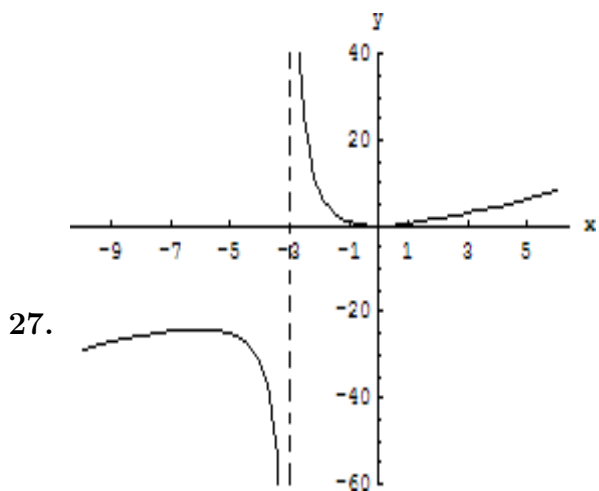


Fig. 6: x-int: $(0, 0)$, y-int: $(0, 0)$; VA: $x = -3$, HA: none, Oblique: $y = 2x - 6, (-3, \infty)$

28. $(5, 4)$

29. $\left(\frac{5}{2}, 3\right)$

30. \emptyset , no solution

31. $(4, -2, 1)$

32. $(-z - 2, 4z + 5, z)$

33. a) $f(x) = 2\sqrt{x+3} - 1$

b) $f(x) = -(x - 4)^2 + 3$

c) $f(x) = |x - 2| + 2$

d) $f(x) = -(x + 3)^3 - 2$

34. $f(x) = -3(x + 4)^2$

35. $\log 5 + \frac{1}{2} \log y - 2 \log x$

36. 41 guppies, 12 days(11.4)

37. $k = -.0315(3.15\%)$, 73%

38. 2.72 million

39. $\sqrt{26}$

40. center: $(-2, 1)$; radius: 3

41. x-int: $(0, 0)(-3, 0)(3, 0)$; y-int: $(0, 0)$; Symmetry: Origin

42. a) Domain: $(-\infty, 1) \cup (1, \infty)$; b) no; c) $f(x) = 4$, $(3, 4)$; d) $x = \frac{7}{4}$, $\left(\frac{7}{4}, 9\right)$

43. a) $(-3, \infty)$; b) x-int: $\left(-\frac{1}{2}, 0\right)$, y-int: $(0, 1)$; d) $\{y | y < 5\}$

44. a) $(f + g)(x) = x^2 - 9x - 6$, Domain: all reals;

b) $\left(\frac{f}{g}\right)(x) = \frac{x^2 - 5x + 1}{-4x - 7}$, Domain: $x \neq -\frac{7}{4}$

45. a) $R(x) = \frac{-1}{10}x^2 + 150x$

b) $R(100) = \$14,000$

c) 750; $R(750) = \$56,250$

d) \$75

48.

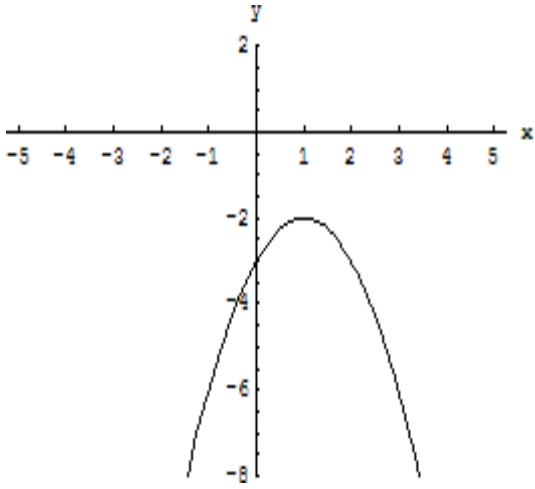


Fig. 7: a) vertex: $(1, -2)$, y-int: $(0, -3)$, x-int: none;
axis of symmetry: $x = 1$; b) $(-\infty, \infty)$

49. a) $\frac{1}{9}$ b) $x = 3$

50. a) none b) Min: $(1.5, 2.75)$ c) $(1.5, \infty)$