Solutions For the Old Exams Problems

1 Section 4.2

1. $g(x) = -\left(\frac{1}{3}\right)^x + 3$

   (a) Range $(-\infty, 3)$.
   (b) Asymptote $y = 3$

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

   (a) Translation: 2 units to the right and 1 unit down.
   (b) $(0, 8)$ is a y-intercept and $(2, 0)$ is an x-intercept.

3. $f(x) = -\left(\frac{2}{3}\right)^x + 2$

   (a) f is an increasing function.
   (b) Y-intercept $(0, 1)$.

4. $8e^{-2x}\left(e^{4x} + 1\right)$.

5. $y = 2^x$.

6. $f(6) = 27$

7. $k = 9$ and $a = \frac{1}{3}$.

8. Domain $(-\infty, \infty)$ and Range $[1, \infty)$.

9. $(-\infty, 0) \cup (2, \infty)$.

10. e

2 Section 4.3

1. $f(x) = \log_{\frac{1}{2}}(3 - x)$

   (a) Domain $(-\infty, 3)$ Range $(-\infty, \infty)$ Asymptote $x = 3$
   (b) $f^{-1}(x) = -\left(\frac{1}{2}\right)^x + 3$.

2. $x = a^y + 1$

3. $f(x) = -\log_{\frac{1}{2}}(x + 9) - 1$

   (a) X-intercept $(-6, 0)$ Y-intercept $(0, 1)$
   (b) Domain $(-9, \infty)$ Range $(-\infty, \infty)$
   (c) Asymptote $x = -9$

4. $f(x) = -\frac{1}{2} + \log_9 (1 - 2x)$

    (a) Domain $\left(-\infty, \frac{1}{2}\right)$ Range $(-\infty, \infty)$

    (b) Asymptote $x = \frac{1}{2}$

    (c) X-intercept $(-1, 0)$ Y-intercept $\left(0, -\frac{1}{2}\right)$

5. Domain $(-\infty, 0) \cup (0, \infty)$ Range $(-\infty, 1]$

6. d

7. Domain $(-1, 1)$

8. X-intercept $(4, 0)$ Y-intercept $(0, -2)$

9. $f^{-1}(-2) = \frac{11}{2}$

10. d

11. c

12. b

13. b

14. d

15. a

16. $f(4) = 6$

3   Section 4.4

1. $f(2 \ln 3) = \frac{80}{9}$

2. (a) $\log_2 \left(xy^3 z^7\right)$

    (b) $\log_2 \frac{2y}{x}$

    (c) $\log_3 \frac{3x^5 z^2}{y^4}$

    (d) $\log_2 \frac{zx^3}{y^2}$

3. (a) 4

    (b) 2

    (c) $\frac{13}{10}$

    (d) $\frac{-2}{9}$

    (e) 1

    (f) 3

    (g) $\frac{15}{8}$

(h) 2

(i) $\frac{1}{5}$

4. (a) $2x + 2y - 2$

   (b) $y - 2x + 2$

5. $4 + 2y + 4x$

6. $\frac{1}{2}$

7. $3x + 4y$

8. $4 + \frac{3}{2}x$

9. (a) $\frac{5}{36}$

   (b) $\frac{-1}{4}$

10. 4

11. $\frac{a+b+1}{2a}$

12. -6

13. $\frac{x}{y-x}$

14. 2

15. $\ln a$

16. 3

17. 2

18. $\log_{\frac{1}{a}} x$

19. b

20. d

21. e

22. (a) $(-4, -3)$

    (b) $(3.\infty)$

    (c) $(-4, 0) \cup (0, 4)$

    (d) $(0, 1)$

    (e) $(0, 1) \cup (4, \infty)$

    (f) $\left(0, \frac{1}{2}\right)$

4 Section 4.5

1. (a) 2
   (b) 1
   (c) $\{2, \log_2 3\}$
   (d) $\frac{-5}{3}$
   (e) $\frac{\ln 2}{2 \ln 5}$
   (f) 2
   (g) $\{0, 1\}$
   (h) $\frac{9}{5}$
   (i) $\{-1, 2\}$
   (j) -4
   (k) $\{\ln 2, \ln 3\}$
   (l) ϕ
   (m) 2
   (n) $\frac{5 \pm \sqrt{17}}{2}$
   (o) $\ln 2$

2. (a) 3
   (b) 4
   (c) ϕ
   (d) 3
   (e) ϕ
   (f) -3
   (g) 4
   (h) 25
   (i) $\{1, 100\}$
   (j) $\frac{1}{8}$
   (k) 125
   (l) $\sqrt{3}$
   (m) ϕ
   (n) 2
   (o) 11
   (p) $\{10, 100\}$
   (q) 2
   (r) -2

(s) $\{1, e^{-1}\}$

(t) $\frac{-1}{6}$

(u) 4

(v) 8

(w) $\{e, e^2\}$

3. Product $= 14$

4. -8

5. $t = \frac{x+y}{2y-x}$

6. $x = e^{y-1} + 3$

7. $x = \frac{1}{2} \log \frac{1+t}{1-t}$

8. $\frac{1}{8} P_o$

9. $\sqrt{2}$

10. $\{0, 2\}$