Extra Practice for Exam 3-Key

1. $(f \circ g)(4) = \sqrt{5}$, and $(f \circ g)(2) = \sqrt{-5}$, not a real number.

2. (a)

   $f \circ g = 1 - 2\sqrt{x-2}$, domain is $[2, \infty)$.

   $g \circ f = \sqrt{-2x-1}$, domain is $(-\infty, -1/2]$.

   $f \circ f = 4x - 1$, domain is $(-\infty, \infty)$.

   (b)

   $f \circ g = \sqrt{(x+4)^2} = |x+4|$, domain is $(-\infty, \infty)$.

   $g \circ f = (\sqrt{x}+4)^2$, domain is $[0, \infty)$.

   $f \circ f = \sqrt{\sqrt{x}} = x^{1/4}$, domain is $[0, \infty)$.

   (c)

   $f \circ g = \frac{-4x+17}{-2x+11}$, domain is $(-\infty, 3) \cup (3, 11/2) \cup (11/2, \infty)$. Remember to consider the domain of g in the composition!

   $g \circ f = \frac{-3x+3}{2x+8}$, domain is $(-\infty, -4) \cup (-4, -1) \cup (-1, \infty)$. Remember to consider the domain of f in the composition.

   $f \circ f = -\frac{2x+5}{x-2}$, domain is $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$.

   (d)

   $f \circ g = \sqrt{\frac{5}{x-3}}$, domain is $(3, \infty)$.

   $g \circ f = \frac{\sqrt{x-1}+2}{\sqrt{x-1}-3}$, domain is $[1, 10) \cup (10, \infty)$.

   $f \circ f = \sqrt{\sqrt{x-1}-1}$, domain is $[2, \infty)$.

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

   (b) $b^{-1}(x) = -\sqrt{x+5}$

   (c) $c^{-1}(x) = 1 + \sqrt{x}$

   (d) $d^{-1}(x) = \frac{x}{x-2}$

(e) $e^{-1}(x) = \{(2,1),(3,2),(4,3),(5,4)\}$

(f) $f^{-1}(x) = \frac{3x+4}{2x-3}$

(g) $g^{-1}(x) = 3^{x+4} - 1$

(h) $h^{-1}(x) = \frac{\ln(x-3)+1}{2}$

(i) $i^{-1}(x) = e^{(x-1)/5} - 3$

(j) $j^{-1}(x) = x^2 + 7, x \geq 0$

(k) $k^{-1}(x) = \log_3(x-7) + 1$

4. $f^{-1}(x) = \ln \frac{x}{5-x}$

5. (a) $(-\infty, \infty)$

(b) $(2, \infty)$

(c) y-intercept at $(0,3)$, no x-intercept.

(d) increasing (only) on $(-\infty, \infty)$

(e) horizontal asymptote: $y = 2$

(f)

6. (a) $(-\infty, \infty)$

   (b) $(-\infty, 1/3)$

   (c) $(-\infty, -1) \cup (1, \infty)$

   (d) $[0, \infty)$

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

   (f) $(-\infty, 0) \cup (0, \infty)$

   (g) $(4, 7)$

7. See attached sheet for graphs.

8. (a) -1

   (b) $x - k$

   (c) $1/2$

   (d) 3

   (e) 100

   (f) $\sqrt{2}$

   (g) 10

   (h) -2

   (i) -2

   (j) 0

   (k) undefined

   (l) -3

9. (a) $3\log_{1/4}(x) + \log_{1/4}(y)$

   (b) $\frac{1}{2}\log_4(x) - \log_4(y)$

   (c) $3\log(x) + 2\log(y) - 2$, since $\log(100) = \log(10^2) = 2$

   (d) $\frac{1}{2}\log_4(x^2+2) - \log_4(4) - 3\log_4(x+1) = \frac{1}{2}\log_4(x^2+2) - 1 - 3\log_4(x+1)$

   (e) $\frac{1}{4}\log(x) + \log(y)$

   (f) $\frac{3}{4}\ln(y) - 5$

10. (a) $\log\left(\frac{x\sqrt{x^2+1}}{3}\right)$

    (b) $\log(64^{1/3}x^{1/2}) = \log(4\sqrt{x})$

    (c) $\ln\left(\frac{x\cdot(2x)^{1/3}}{(x+1)^3}\right)$

    (d) $3\log(5) - 1 = 3\log(5) - \log(10) = \log(25/2)$