HOMEWORK DAY 1 – *Inverse Functions §6.1*

1. §6.1: 3.   *Answer: Not 1-1 since the value 2.0 is taken on twice, by $x = 2$ and $x = 6$*

2. §6.1: 4.

3. §6.1: 5.

4. §6.1: 6.

5. §6.1: 11.

6. §6.1: 12.

7. §6.1: 18.

8. §6.1: 19.

9. §6.1: 20.

10. §6.1: 34.

11. For each of the following functions:

(i) Sketch a graph of f and determine if it is invertible.

(ii) If invertible, find a formula for f^{-1}.

(iii) If invertible, add the graph of f^{-1} in the same plot in (i) showing the graph of f. The graph should clearly show all ranges and domains.

(a) $f(x) = x^2 - 2x$

(b) $f(x) = x^2 - 2x,\ x \geq 1$

(c) $f(x) = 1/x$

(d) $f(x) = x^{1/3}$

12. Suppose the function f is invertible, with point $P(2,3)$ on its graph, and slope $1/7$ at P. Find an equation for the line tangent to f^{-1} at $Q(3,2)$.

13. For each of the following functions, find an equation for the tangent line to $f^{-1}(x)$ at $x = x_0$, where x_0 is a given.

    (a) $f(x) = x^5 + x^3 + x$, $x_0 = 3$

(b) $f(x) = x^3 + 3\sin(x) + 2\cos(x)$, $x_0 = 2$

(c) $f(x) = \displaystyle\int_3^x \sqrt{1 + t^3}\, dt$, $x_0 = 0$

14. §6.2: 15. (Find domain)

15. Find the following limits

    (a) §6.2: 23.

    (b) §6.2: 24.

    (c) §6.2: 25.

    (d) §6.2: 26.

(e) §6.2: 28.

(f) §6.2: 29.

16. Differentiate the following functions

   (a) §6.2: 31.

   (b) §6.2: 33.

(c) §6.2: 34.

(d) §6.2: 35.

(e) §6.2: 36.

17. In one plot, sketch the graphs of the following functions: $f(x) = 2^x$, $g(x) = e^x$, $h(x) = e^{-x}$.

18. Find the domain and all asymptotes of the following functions:

(a) $f(t) = \dfrac{e^t}{1 + e^t}$

(b) $f(t) = \dfrac{e^t}{1 - e^t}$

19. §6.2: 51 (find tangent line)

20. Compute the integrals:

(a) $\int_0^1 (x^e + e^x)\, dx$

(b) $\int e^{\sin x} \cos x\, dx$

21. §6.3: 3.   *(a) Answer:* $\log_3 81 = 4$ *since* $3^4 = 9^2 = 81$

22. §6.3: 4.

23. §6.3: 5.

24. §6.3: 6.

25. §6.3: 10(b).

26. §6.3: 43.

27. §6.3: 44.

28. §6.3: 45.

29. Sketch the graphs of the following functions.

(a) $f(x) = \ln(x)$

(b) $f(x) = \ln(1/x)$

(c) $f(x) = \ln(x - 1)$

(d) $f(x) = \ln|x|$

(e) $f(x) = \ln(x + c),\ 0 < c < 1$

30. Solve the following inequalities and equations for x.

    (a) $\ln x < 0$

    (b) $\ln x > 1$

    (c) $\frac{e^x}{1-x} = 0$

    (d) $\ln(e^x - 3) = 2$

    (e) $\ln x + \ln(x+1) = 0$

31. Evaluate the limits.

(a) $\lim\limits_{x \to 1^+} \ln(x - 1)$

(b) $\lim\limits_{x \to 1^-} \ln(x - 1)$

(c) $\lim\limits_{x \to 0} \ln(\cos x)$

(d) $\lim\limits_{x \to 0^+} \ln(\sin x)$