1.  

2. Start with $|f(x) - L| < \epsilon$: here, it is $|6 - \frac{4}{7}x - 50| < .3$. This simplifies to $\left| -\frac{4}{7}x - \frac{8}{7} \right| < .3$. Factor out the $-4/7$ to get $\frac{4}{7}|x + 2| < .3$ so that $|x + 2| < .3 \times 7/4 = .525$. Use $\delta = .525$.

3. a) Factor to $x - 2$; $L = -.5$. b) Common denominator up top gives $1/3x$; $L = -1/9$. c) Conjugate gives $1/(\sqrt{x + 1} + 1)$; $L = 1/2$. d) Direct substitution gives $L = 0$. e) No cancellation: $L$ dne. f) Simplify to $3 + x$; $L = 3$.

4. a) $\lim_{x \to -2} \frac{x - 2}{x - 2} = 1$. b) $\lim_{x \to 2^{-}} \frac{-x - 2}{x - 2} = -1$. c) dne.

5. Listed in text. Be prepared to write these and use them in standard problems on the exam.

6. Let $f(x) = x^3 - x^2 + x - 20$. $f(2) = -14$ and $f(3) = 1$. Since $f$ is continuous (it’s a polynomial), the Intermediate Value Thm applies and hence there must be some point $c$ where $2 < c < 3$ for which $f(c) = 0$.

7. $f$ has a jump at $x = 0$ and an infinite discontinuity at $x = 2$. Note that the asymptote is only on the right, but that’s enough for us to call it an inf. disco.

8. The rate of change of $C$ is $C''(x) = 1.5 - 500/x^2$. When $x = 500$, $C''(500) = 1.5 - 1/500$.

9. The difference quotient is $\frac{1}{h} \left( \frac{1}{\sqrt{x + h}} - \frac{1}{\sqrt{x}} \right) = -\frac{1}{\sqrt{x \sqrt{x + h}} \sqrt{x + h} \sqrt{x}}$. Taking the limit gives $\frac{-1}{(2\sqrt{x})} = -\frac{1}{2}x^{-3/2}$. At $x = 4$, the slope of the tangent is $-1/16$, so the line is $y - 1/2 = -1/16(x - 4)$.

10. a) 2. b) dne; jump at $x = 4$. c) 7. d) 0 (it’s the slope at $x = 2/5$). e) 2 (slope at $x = 1$).

11. a) There might be a removable discontinuity. B) False; this just says it works for one $\epsilon$; it must work for all $\epsilon$ for the limit to exist. c) Might be true or false. If $x = a$ is not in the domain, there might just be a hole (the limit exists), or there might be a jump or a vertical asymptote (the limit dne).

12. a) $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$. b) $g = \frac{\sqrt{g} - 17}{g^2}$, where $g(t) = t^2 - 2$. $f(x) = \frac{\sqrt{x} - 17}{x^2}$.

13.

14.

15.

16. $f'(x) = \frac{3}{4}x^{1/3} - \frac{27}{64}x^{-7/4}$. $g'(x) = \frac{[2x + 1](x^2 + 1) - [2x](x^2 + x + 1)}{(x^2 + 1)^2} = \frac{1 - x^2}{(x^2 + 1)^2}$.

$h'(x) = \left[ -4x^{-5} - \frac{1}{11}x^{-2/11} - 35x^{-10/3} \right] \left( \sqrt{x} - \frac{x}{x + 1} \right) + \left( x^{-4} - \frac{1}{5}x^{9/11} + 15x^{-7/3} + 12 \right) \left[ \frac{1}{2}x^{-1/2} - \frac{1}{(x+1)^2} \right]$.