Calculus 1B Final Exam Review Sheet GSI: Paul Baginski

This problems on this review primarily concern the material from the final third of the course. For practice problems for the material from the first two-thirds of the course, see the two midterm review sheets.

Do not forget that quizzes for *both* sections are available on the webpage
http://math.berkeley.edu/∼baginski/Teaching.html
Each section gets rather different problems.

Integrate:

1. $\int \frac{\sin^2(\ln(x))}{x}\, dx$
2. $\int \frac{x^5}{x^3-x^2+x-1}\, dx$
3. $\int \sec^7(x)\tan^3(x)\, dx$
4. $\int \frac{x^5}{(x^2+1)^3}\, dx$
5. $\int xe^{\sqrt{x^2-4}}\, dx$
6. $\int xe^{\sqrt{x^2-\sqrt{12}\,x+3}}\, dx$
7. $\int \sqrt{4+\sqrt{16-x^2}}\, dx$
8. $\int \sin^2(3x)\cos(6x)\, dx$
9. $\int x^2\ln(x^2)\, dx$
10. $\int \frac{e^{2x}}{(e^x+1)(e^x+2)}\, dx$

For the following functions $f(x)$, perform these tasks:

(1) Write the Maclaurin series.
(2) Determine the 6th derivative of the function at $x = 0$.
(3) Determine the interval of convergence for the Maclaurin series.

The functions:

1. $f(x) = \ln(x^4+1)$
2. $\sqrt{4-x}$

3. $\frac{\sin(\sqrt{x})}{\sqrt{x}}$

4. $e^{-x} - \cos(x)$

Find the general solution to the following differential equations, or if initial values are given, solve the initial value problem.

1. $y'' - 2y' - 3y = e^{3x+2}$

2. $y'' - 9y' - 10 = (x^2 + 3)e^{-x}$

3. $y'' + 9y = \sin^4(3x)$

4. $y' = x^2 y + \frac{y}{x} + 5$

5. $y'' + xy = 0$

Find the arc lengths.

1. $y = \ln\left(\frac{e^x+1}{e^x-1}\right),\ \ln(2) \leq x \leq \ln(3)$

2. The perimeter of the figure inscribed by the two functions: $f(x) = x^2 - 9$ and $g(x) = 9 - x^2$.

Find the surface area of the figure resulting from rotating $y = x^2$ around the x-axis, allowing $1 \leq x \leq 3$.