Mathematics 181**A** **Fall 2008**

Exam 2

October 16, 2008

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Name

Technology used: ____ **Only write on one side of each page.**

- Show all of your work. Calculators may be used for numerical calculations and answer checking only.

1. $[2, 2, 6$ points$]$ Given the rational function below.
   (a) Verify it is a proper fraction.
   (b) Verify the denominator is a product of linear and irreducible quadratic factors.
   (c) Write out the partial fraction decomposition. **Do not solve** for the constants.

$$\frac{3x^{12} - 7x^8 + 4x^5 + 4x^2 - 34x + 2008}{x^4(x-4)(x+7)^2(x^2+2x+5)^3}$$

2. [15 points each] Evaluate any **two** (2) of the following integrals by hand (no calculators).

(a) $\int \frac{2}{(x-1)(x^2+1)}\ dx$

(b) $\int \sin^5(3x)\ dx$

(c) $\int \frac{x^2\,dx}{\sqrt{1-9x^2}}$

3. [8, 7 points] Do **both** of the following. A solid is obtained by rotating the region bounded by the curves $y = x + 4$ and $y = (x - 2)^2$ about the x-axis. Set up (but do not evaluate) the integral(s) appropriate for finding the volume using:

   (a) Cross-sectional areas (Slicing).

   (b) Cylindrical shells.

4. Solve the initial value problem

$$\frac{dy}{dt} = \frac{2y + 2}{t^2 + 2t}, \quad t > 0, \ y > 0, \ \text{and } y(1) = 1$$

5. [15 points] Find the length of the curve given by the parametrization $x = \cos^3(t), \quad y = \sin^3(t)$, $0 \le t \le \frac{\pi}{2}$. [Useful fact: $\sin^2(t) + \cos^2(t) = 1$]

6. [15 points] Find the area of the surface generated by revolving the curve $y = \sqrt{2x+1}$, $0 \le x \le 3$ about the x-axis.