MCS 119 – Fall 2009
Antiderivatives and Integration Review

1. Find an antiderivative for each of the following functions.

   (a) $g(z) = 2z^2 - 3z^2 + 7z^4 - 6$

   (b) $f(t) = (3t - 1)(t + 2t^2)$

   (c) $r(t) = 2t^{-3} - t^{-2} + 1$

   (d) $f(x) = \dfrac{x^3 + 3x^2 + x^{4/3}}{x}$

   (e) $f(x) = \dfrac{10}{\sqrt{x}}$

2. Find an antiderivative $F(x)$ with $F'(x) = f(x)$ and $F(0) = 1$.

   (a) $f(x) = 3$

   (b) $f(x) = -7x + 2$

   (c) $f(x) = \sqrt{x}$

3. Find the following indefinite integrals.

   (a) $\displaystyle\int 3x \; dx$

   (b) $\displaystyle\int x^5 - 12x^{-2} + 3dx$

   (c) $\displaystyle\int (2x - 3)(x - 4)dx$

   (d) $\displaystyle\int \pi dx$

4. Using the Fundamental Theorem, evaluate the following definite integrals exactly.

   (a) $\displaystyle\int_1^2 (5x^2 - 4x + 3)dx$

   (b) $\displaystyle\int_{-2}^2 x^3 + 1dx$

   (c) $\displaystyle\int_{-5}^5 x^2 + x^4 dx$

5. Calculate the area of the region that lies under the curve $y = x - x^2$ and above the x-axis.

6. The velocity of a thrown tomato is given by $v(t) = -32t + 100$. Find an equation for the position of the tomato thrown from the top of a 30 foot tall building. How high does the tomato go? When does the tomato hit the ground?