Name: _____

Section #: _____

# Math 165: Final Exam — Part 1
## Fall 2014

This part of the exam has 8 problems for a total of 40 possible points. Each problem is worth 5 points.

You may **NOT** use a calculator on this section. You must show all work, but you need not simplify your answers unless instructed to do so. This part of the exam will be collected after 50 minutes.

Question 1: _____

Question 2: _____

Question 3: _____

Question 4: _____

Question 5: _____

Question 6: _____

Question 7: _____

Question 8: _____

40 **Total Points:** _____

**Question 1.** Evaluate $\int \left( 4x^7 - 3x^3 - \frac{1}{3}\sqrt[3]{x} + 2x^{-1} - \frac{\pi}{x^{7/2}} + 165 \right) dx$.

**Question 2.** Evaluate $\int_1^4 \frac{(2\sqrt{x} - 3)^3}{3\sqrt{x}} dx$.

**Question 3.** A function $F(x)$ has derivative $F'(x) = x - 6e^{2x} + 1$ and it is known that $F(0) = 0$. Find the value of $F(2)$.

**Question 4.** Find $\dfrac{dy}{dx}$ if $y = (x^2+1)\tan^{-1}(x^2+1)$. There is no need to simplify your answer.

**Question 5.** Let
$$f(x) = x\sqrt{\ln x} \qquad \text{and} \qquad g(x) = e^{\frac{x}{10}}.$$
As $x \to \infty$, does $f(x)$ grow faster than $g(x)$, does $g(x)$ grow faster than $f(x)$, or do the two functions grow at the same rate? Be sure to justify your answer.

**Question 6.**

a. Let $G(z) = \int_1^z e^{-t^2} \, dt$. Find the value of $G'(1)$. (2 points.)

b. The function $H$ is defined by $H(z) = \ln\left(3z + \int_1^z e^{-t^2} \, dt\right)$. Find the value of $H'(1)$. (3 points.)

**Question 7.** A function $g$ is defined by

$$g(t) = \begin{cases} 4t - 3 & t < 1 \\ -\cos(\pi t) & t \geq 1. \end{cases}$$

Calculate the value of $\int_{-2}^{2} g(t)\, dt$.

**Question 8.** Evaluate $\int \dfrac{4e^{3x}}{e^{6x} + 1}\, dx$.