Name: _____
Student ID: _____

Test 2

This test is graded out of 43 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(3 marks)* Evaluate the definite integral:

$$\int_{\pi/12}^{\pi/9} \sin^2 3\alpha \, d\alpha$$

Question 2. *(5 marks)* Evaluate the improper integral or show it diverges:

$$\int_{-\infty}^{\infty} \frac{1}{2x^2 - 4x + 4} \, dx$$

Question 3. *(5 marks)* Evaluate the indefinite integral:

$$\int \csc^3 5\theta \cot^3 5\theta \, d\theta$$

Question 4. *(5 marks)* Find the length of the curve.

$$y = \ln(\sec x),\ 0 \leq x \leq \frac{\pi}{4}$$

Question 5. *(5 marks)* Sketch and find the total area of the region(s) bounded by the graphs of $y = \arctan x$, $y = \frac{\pi}{4}x$.

Question 6. *(5 marks)* Evaluate the indefinite integral:

$$\int \frac{3x^2+3x+2}{x^3+2x}\,dx$$

Question 7. *(5 marks)* Set up the integral to find the volume of the solid obtained from the region bounded by the graphs of $y = (x+1)^2 + 1$, $y = \sqrt{x+1} + 1$ rotated about the line $y = 2$.

Question 8. *(5 marks)* Evaluate the indefinite integral:

$$\int \frac{81\sqrt{9x^2+81}}{x^6}\,dx$$

Question 9. *(5 marks)* For what values of m do the line $y = mx$ and the curve

$$y = \frac{x}{x^2 + 1}$$

enclose a region? Find the area of the region.

Bonus Question. *(5 marks)* Evaluate the limit.

$$\lim_{h\to 0} \frac{\int_1^{\cos h} \arctan x \, dx}{3e^{-h} - \ln(h+1) + \sin(4h) - 3}$$