MAT 254 – Winter Quarter 2003
Final Exam

NAME_____

Show work and write clearly. Answers without work to support them will not receive full credit. Answers without correct notation will not receive full credit.

Where necessary, estimate to 4 decimal places.

1. (20 pts.). Without using the *allsums* program, estimate the area under the graph of $f(x) = (1 - x)(2x + 3)$ from $x = -3$ to $x = 3$ using three approximating rectangles and midpoints. Sketch the graph and the rectangles. Is your estimate an underestimate or an overestimate? Explain.

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2. (15 pts.). Sketch the region enclosed by $y = x^2$, $y = 8 - x^2$ and $4x - y + 12 = 0$. Find the area.

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3. (20 pts.). Find the volume of the solid formed by revolving the region bounded by $y = \sin x$, $x = 2\delta$, $x = 3\delta$ and $y = 0$ about the y-axis. Sketch the area.

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4. (5 pts.). Use simpson's rule with $n = 30$ to find the length of the curve $y = \csc(2x)$, $0.5 \le x \le 1.5$.

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5. (10 pts.). Derive the formula for the derivative of $\sin^{-1}(x)$. Show all steps and be specific.

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6. (15 pts.). Find $\lim_{x \to 0} \dfrac{\tan x - x}{x^3}$.

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7. (10 pts.). Find $\int_0^2 x^2 3^x \, dx$.

(5 pts.) **Answer only ONE of the following:**

8. Find $\int_e^\infty \dfrac{1}{x \ln x} \, dx$

9. Find $\int \cos^4 x \sin^3 x dx$.