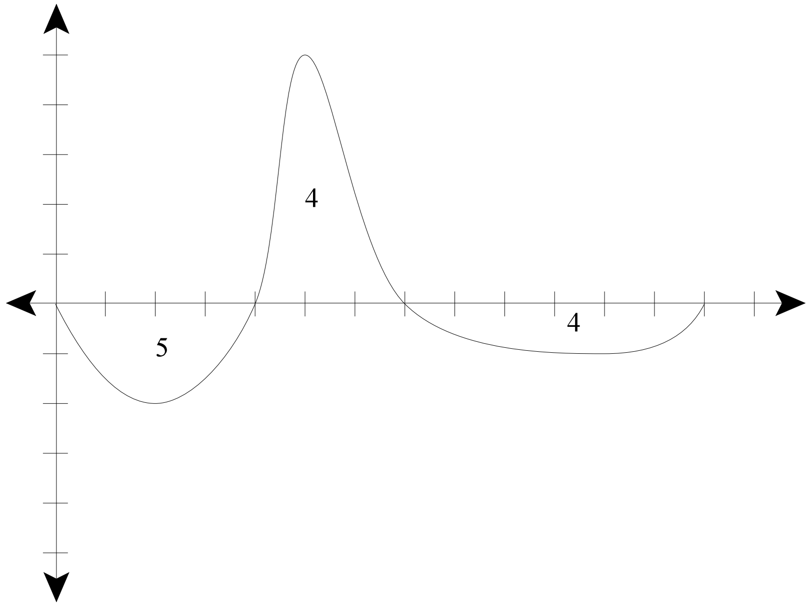
Exam 1a Calc 2 1/30/2004

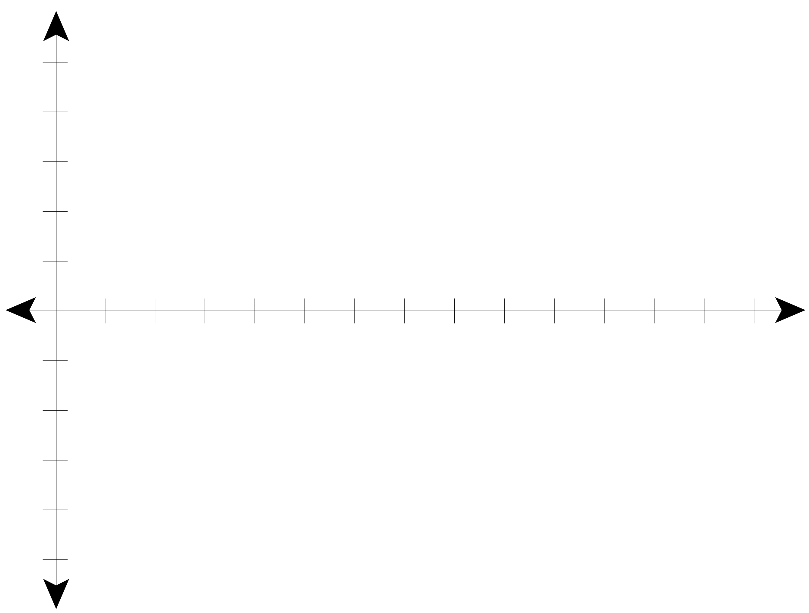
Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Use a table to **integrate** $\int x^2 e^{5x}\, dx$.

2. If an ugli fruit is thrown upward at 30 feet per second from a height of 12 feet [and acceleration due to gravity is 32 feet per second^2 downward], find formulas for the egg's velocity and height after *t* seconds.

3. Given the graph of F′(x) shown below (with the areas of several regions marked) and the fact that F(0) = 5, sketch the graph of F(x) and label the coordinates of all critical points on the graph of F(x).





4. If F(x) = $\int_x^1 \sqrt{t^6+4}\,dt$, what is F′(x)?

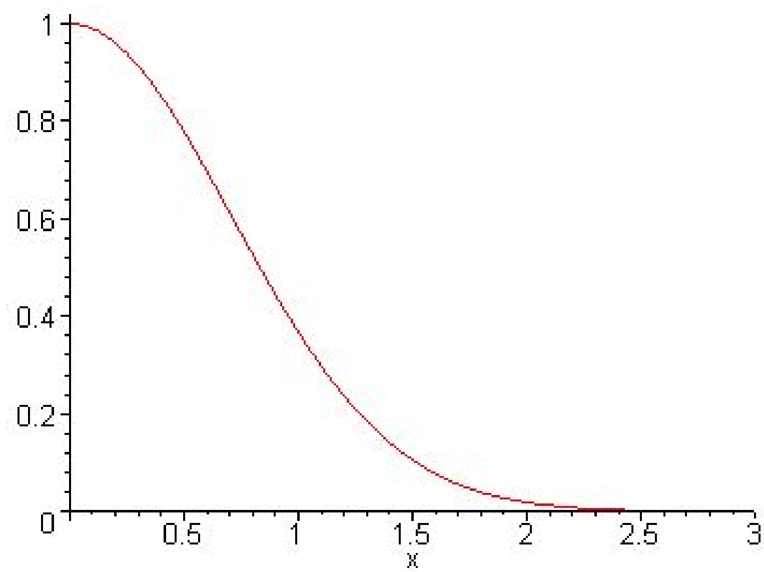
5. **Integrate** $\int \frac{2}{(3t+5)^2}\,dt$.

6. If $\int_1^3 e^{(-x^2)}$ has been approximated with $L_{20} = 0.1583$, $R_{20} = 0.1216$, and $M_{20} = 0.1391$,

(a) What are T_{20} and S_{20} (rounded to 4 decimal places)?

(b) Will L_{20} be greater than or less than the true value of the integral? How can you tell?

(c) Will M_{20} be greater than or less than the true value of the integral? How can you tell?



7. Use partial fractions to reduce $\int \frac{20}{25-x^2}\,dx$ to two simpler integrals and integrate them.

8. Biff is a calculus student at Factory State University, and he's having some trouble. Biff says "Dude, I totally don't understand this intergation stuff. I can't understand my teacher because he's got so much accent and besides he only faces the chalkboard the whole class anyway. But I take really good notes, even if I don't know what they mean, so I've caught on that you put a "+C" at the end of a lot of problems. I guess it must be important, but I've got no clue what it means. Is it like some famous math guy's initial or something?"

Explain clearly to Biff **when** an answer involves a "+C" and **why**.

9. Find a formula for $\int_0^1 e^{ax}\,dx$ in terms of the constant *a*.

10. Derive line 24 of our table of integrals, that is, use the trig substitution $x = a \tan \theta$ to show how the integral $\int \frac{1}{x^2 + a^2} dx$ works out to be $\frac{1}{a} \arctan \frac{x}{a} + C$ [as long as a isn't zero].

Extra Credit (5 points possible):

Show that $\int \cos^2 \theta \, d\theta = \frac{1}{2} \cos\theta \sin\theta + \frac{1}{2}\theta + C$ [without relying on a table].