

Name _____

1. (18 points) Without using a calculator, evaluate the following indefinite integral.

$$\int \left(10e^{2x} - \frac{1}{3x} + 7 \right) dx$$

2. (18 points) Without using a calculator, evaluate the following definite integral. Simplify your answer as much as possible.

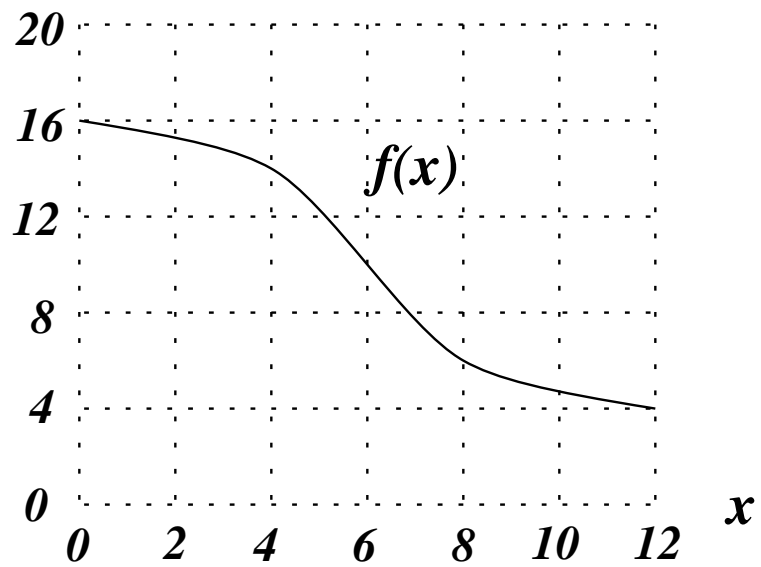
$$\int_1^2 (30x^2 - 4x) dx$$

3. (24 points) Deep in a Hundred Acre Wood where Christopher Robin plays, it has been raining at the rate of $r(t)$ inches per hour since 1:00 PM. I've recorded these rates every 1.5 hours in the table below. The rain has continued to fall down harder and harder until my last recorded entry.

time (t)	rate ($r(t)$)
1:00 PM	0.5
2:30 PM	1.2
4:00 PM	1.7
5:30 PM	2.4
7:00 PM	3.3

- (a) Use the information in the table to give the best possible underestimate for the total number of inches of rain which have fallen between 1:00 PM and 7:00 PM.
- (b) Use the information in the table to give the best possible overestimate for the total number of inches of rain which have fallen between 1:00 PM and 7:00 PM.
- (c) Piglet would really like a better estimate. Show how you can combine your answers above in an attempt to find a closer estimate to the total number of inches of rain which have fallen between 1:00 PM and 7:00 PM.

4. (14 points) One of the ten choices below gives the exact value of the definite integral $\int_0^{12} f(x) dx$. Circle the correct choice.



- | | | | | |
|---------|---------|---------|---------|---------|
| (a) 24 | (b) 48 | (c) 72 | (d) 96 | (e) 120 |
| (f) 144 | (g) 168 | (h) 192 | (i) 216 | (j) 240 |

5. (14 points) Tom measured the tree in his yard and found that it was 48 inches tall. He then applied a strange new fertilizer which caused the tree to grow at a rate of $30te^{-t}$ inches per hour where t is the number of hours since the application of the fertilizer. How tall was the tree 3 hours after he applied the fertilizer? Your answer should be given in inches and should be accurate to at least 2 places after the decimal point.

6. (12 points) The oldest and largest wildlife survey in the world is the Christmas Bird Count sponsored each year by the National Audubon Society. In Athens, Georgia, volunteers counted the number of American Goldfinches and I have recorded their results from 1992 to 1995 in the table below.

year	1992	1993	1994	1995
# goldfinches	256	175	139	110

- (a) Let x be the number of years since 1992. Use the regression features of your calculator to find a formula for the exponential function which best fits this data. Each number in your formula should be given to at least two places after the decimal point.
- (b) Use the formula found in part (a) to estimate the number of goldfinches that one might expect to be counted in 2002.