Name: _____

CLASSWORK 113

Evaluate each definite integral.

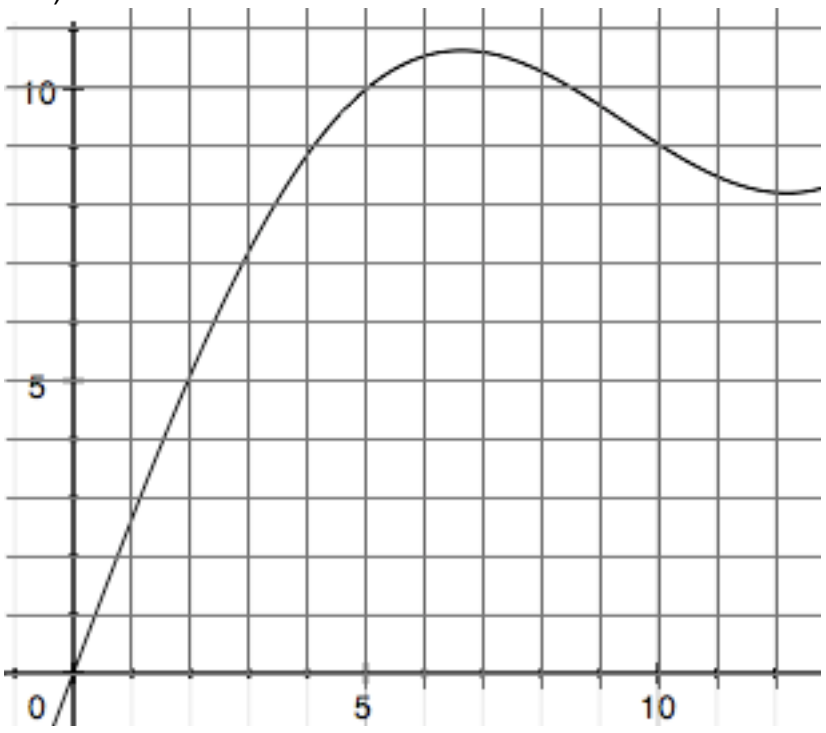
1. $\int_2^5 \cos^{\frac{1}{3}} x \sin x \, dx$

2. $\int_2^5 \frac{\sqrt{\ln x}}{x} \, dx$

3. $\int_2^5 (x^3 + 3x - 4)^{\frac{3}{5}} (x^2 + 1) \, dx$

4. $\int_2^5 x^4 \sin^3 (3x^5) \cos (3x^5) \, dx$

5. Find the area under the curve $y = 5 \sin (1/3x) + x$ from $x = 1$ to $x = 11$.



6. The velocity of an object is given by the equation $y = \sin(3x + 4) + x^2$, where y represents velocity and x represents time.

a) Find the velocity of the object at $x = 4$.

b) Find the acceleration of the object at $x = 4$.

c) Find the position of the object at $x = 1$ and $x = 4$.

d) Find how far the object has travelled between $x = 1$ and $x = 4$.

7. Lily decides that she is not making enough money teaching, so instead she starts working as a waitress at the Awesome Mathematics Restaurant. Her tips at the restaurant are constantly fluctuating depending on the time of day. In fact, the rate at which she is making tips varies according to the equation
$m = \sin t + 5$ where m is her rate of dollars per hour and t is time in hours.

a) How much is Lily making in tips, per hour, at t = 2 pm?

b) If Lily's tips were constant, how much money would she make between 2 pm and 3 pm?

c) Why isn't this the actual amount of money she made?

d) Calculate the actual amount of tips she earns between 2 pm and 3 pm.

8. Many countries, including the U.S., have progressive income tax. This means that you pay a higher percentage of tax the more money you make.

a) Let's say that in the U.S., you pay 0% tax on your first $10,000 of income. You pay 5% the next $10,000 of income, 15% on the next $20,000 of income, 20% tax on the next $20,000 of income, and 35% on any income beyond that.

Under this system, calculate the amount of tax owed by people with the following incomes:

i) $7,000

ii) $15,000

iii) $75,000

b) Newton-land has a progressive tax system that is based on a mathematical equation (surprise!) The rate of tax you pay on the **nth** dollar you earn is given by $\mathbf{R} = \sqrt{\frac{N}{100{,}000}}$

i) Find **rate** of tax on the $10,000th dollar (how many cents of it goes to the government)

ii) Find the rate of tax on the $75,000th dollar.

iii) Find the total amount of tax paid in Newton-land by a person who makes $75,000.