**Name:** _____

## CLASSWORK 73

1. Find the derivative of each function.

a) $y = (\ln x)^3$ b) $y = \ln x^3$ c) $y = (\ln x) \cdot x^3$

2. a) Write 12 as " e to a power"

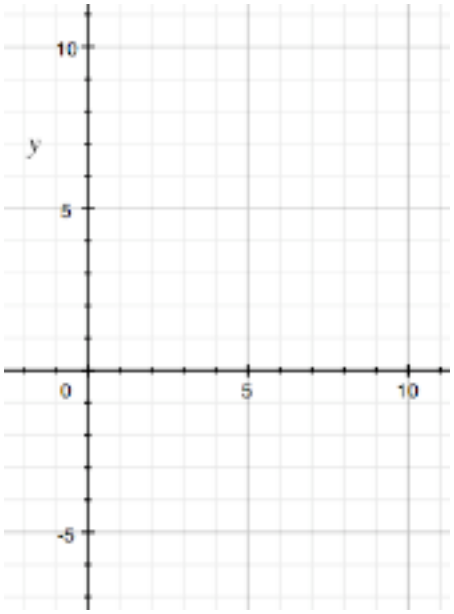
b) Use your answer to (a) to find the derivative of $y = 12^x$

3. a) Write x as "e to a power"

b) Use your answer to (a) to find the derivative of $y = x^{3x+1}$

4. A particle is following the curve $y = 2x - 6$. It's x- coordinate is related to time by the equation $x = t^2$.

a) Sketch a graph of what is happening.




b) Mark the object's position at a few times using the chart below.

| t | x | y |
|---|---|---|
| 0 | | |
| .5 | | |
| 1 | | |
| 2 | | |
| 3 | | |

c) Find $\frac{dy}{dx}$

d) Find $\frac{dy}{dt}$

e) Find $\frac{dx}{dt}$

f) Find the product of your answers to (e) and (c)

5. An object is following the curve $y = e^x$. It's x-coordinate is related to time by the equation $x = 2t^2 + 1$.

a) Find $\frac{dy}{dx}$

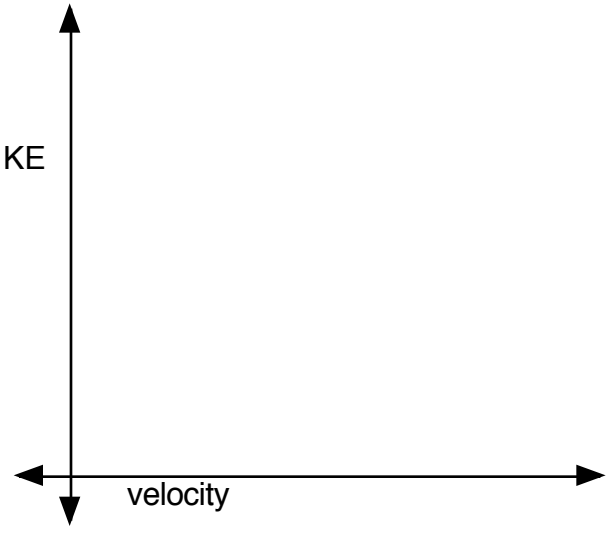
b) Find $\frac{dy}{dt}$

c) Find $\frac{dx}{dt}$

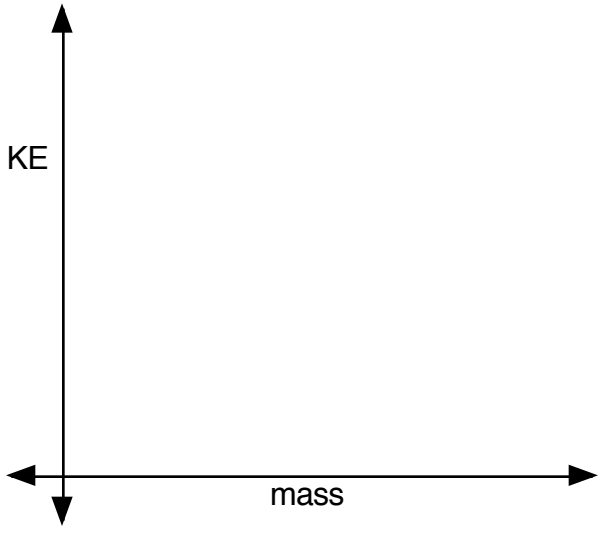
d) Find the product of your answers to (a) and (c)

6. The kinetic energy of an object is described by $KE = 1/2mv^2$

a) Sketch the graph of an object's KE as it depends on velocity when the object has a given mass.




b) Sketch the graph of KE as it depends on the mass of an object when velocity is given.



c) Find $\frac{d\,KE}{d\,v}$

d) Find $\frac{d\,KE}{d\,m}$

e) How much is the KE increasing for each extra m/s of speed when the velocity is 5 m/s?

f) Show that your answer to e is correct by comparing the KE of an object going 5 m/s to the KE of an object going 5.001 m/s.

7. Imagine a freshman is sliding across frictionless ice. Let's say we want to apply a force that will increase the freshman's (final) velocity.

The force needed to accelerate the freshman can be described by the formula

$$F = \frac{m(V_f - V_i)}{t}$$

In other words, it depends on the mass (**m**) of the freshman, the final velocity ($\mathbf{V_f}$) that we want him to obtain, the initial velocity ($\mathbf{V_i}$) that he now has, and the time (**t**) over which our force will act.

a) Find $\frac{d\,F}{d\,m}$

b) Find $\frac{d\,F}{d\,V_f}$

c) Find $\frac{dF}{dt}$

d) Let's define a new variable, g, which is the acceleration of gravity. Find $\frac{d\,F}{d\,g}$

8. Let $g = \frac{abc^2}{m} + f$

a) Find $\frac{dg}{da}$

b) Find $\frac{dg}{dc}$

c) Find $\frac{dg}{dm}$

d) Find $\frac{dg}{df}$