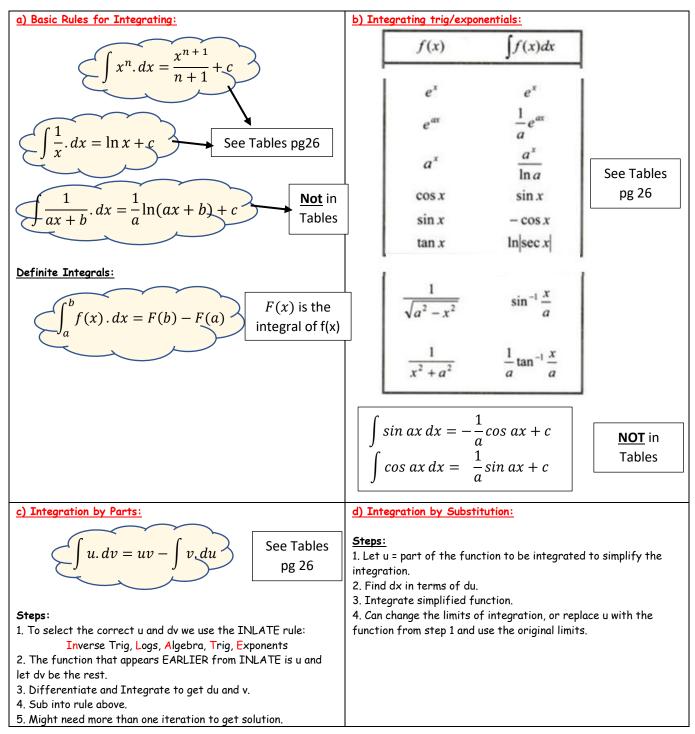
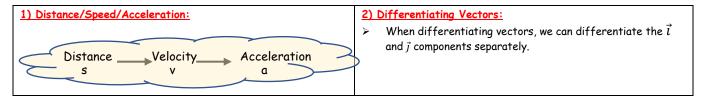
### Topic 8: Calculus & Differential Equations

#### 1) Integration:



### 2) Rates of Change/Differentiating Vectors:



# 3) Work by Variable Force:

a) Work done by a Variable Force:	
<u>Steps:</u>	
1. Get Force in terms of displacement x.	
2. Use rule below to calculate work done between two distances a	
and b.	
$W = \int_{a}^{b} F(x) \cdot dx$	

## 4) Differential Equations:

a) Type 1: 1 <sup>st</sup> Order with general solutions	b) Type 2: 1 <sup>st</sup> Order with definite values
Steps:	Steps:
1. Multiply both sides by dx to eliminate fractions.	1. Same first three steps as Type 1.
<ol> <li>Gather all terms with a 'y' to one side, and the 'x' terms to the other.</li> </ol>	<ol> <li>Use information given to evaluate the constant of integration.</li> </ol>
<ol><li>Integrate both sides.</li></ol>	3. Fill in the constant of integration and get y on its own.
4. Get y on its own.	
<u>c) Type 2: 2<sup>nd</sup> Order Separable</u>	d) Proportionality:
Steps:	> If two quantities P and Q are proportional to each other, we
1. Let some variable be $\frac{dy}{dx}$ e.g. $\frac{dy}{dx} = v$	can say that P = kQ.
2. Rewrite the given equation using v.	
<ol><li>Proceed as in Type 1 and solve for v.</li></ol>	
4. Work back using the substitution from step 1 and solve for	
у.	

## 4) General Tips for the Exam:

0	Do know your integration methods well
Q	be know your integration methods wen

- Do separate the two sides carefully.
- Do put in a scale on all force diagrams.
- Do be careful with signs in the force equation.
- Do choose intelligently between the two possible expressions for acceleration.
- Don't confuse power and force.
- Don't put in the initial speed as a force.