Ch 6 Practice Test - Applications of Integrals

1. Find the total area enclosed between the functions $y = x^2 - 1$ and $y = 4x - 1$, *algebraically*, by a) integrating with respect to x, and b) integrating with respect to y.

2. The region between the curve $y = e^x + x$ and the x-axis from x=0 to 2 is rotated around the line x=4 to create a solid. Find the volume of the solid.

3. The region in the first quadrant between the two curves $y = x^2$ and y= $-3x^2 + 36$ is rotated about the y-axis. Find the volume *algebraically*.

4. Find the volume of revolution of the region defined between the curves $y = x^2$ and $y = 2x$, when the region is revolved around the y axis. *Solve algebraically*, using Discs.

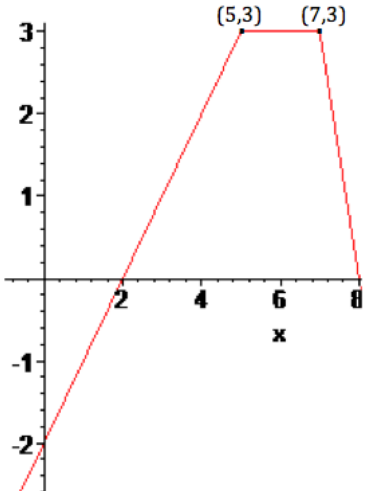
5. Consider the region enclosed by the curve $y = \cos^{-1} x$ and $x = 0$ and $y = 0$ and set up the integral for the volume of revolution about the x axis by
a) Cylindrical Shells
b) Discs, and
c) then evaluate using a graphing calculator. (The answers should match!)

6. Find the work done when a non-constant force of $F(x) = \frac{100}{x^3}$ N is used to move an object from x = 3.0 m to 7.0 m. *Solve algebraically.*

7. A spring is 30 cm long when at rest (not stretched). If 100 N of force stretches the spring to a length of 50 cm, how much work was done to stretch it that far?

8. A gold chain in length is hanging over the edge of a table, suspended 0.75 m below the edge of the table. If the chain has a linear density of 10 N/m (i.e. it weighs 10 N for every metre of length), how much work is done to raise the chain onto the table?

9. Using the velocity function $v(t)$ graphed below,
a) find the displacement over the interval [0, 8].



b) find the distance travelled over the interval [0,8].

c) find the avg velocity over the interval interval [0, 8].

10. For an object that travels according to the following information: $v(t) = 2t^2 - 3\cos t$, $d(0) = 5\ m$,
a) Find the position function, d(t).

b) Find the acceleration function, a(t).

c) Find its displacement over the first 4 seconds.

d) Find the distance covered over the first 4 seconds.

11. A water rocket that is 20 m off the ground is launched upwards at a speed of 10 m/s. Keeping in mind that the **acceleration** due to gravity is constantly $-9.8m/s^2$,

a) How long does the rocket take to reach its highest point?

b) How far off the ground is it at that point?

c) At what time will the rocket hit the ground? (i.e when d=0)

d) What is the speed of the rocket just before it reaches the ground?

e) What is the rocket's displacement, from when it is launched until it hits the ground?

f) What is the total distance the rocket covers, from when it is launched until it hits the ground? *(Try to do it without using the absolute values:* $d(t) = \int |v(t)|dt.$ ☺*)*