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EXERCISE SHEET : FUNDAMENTAL THEOREM OF CALCULUS I

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1. Compute the following integrals using the fundamental theorem of calculus :

i)  $\int_1^4 \sqrt{x} - \frac{1}{\sqrt{x}} dx$

iv)  $\int_1^2 \frac{x-1}{x^2} dx$

ii)  $\int_0^1 e^{2x} - e^x dx$

v)  $\int_0^\pi (\sin(x) - \cos(x)) dx$

iii)  $\int_1^2 \frac{1}{2x} dx$

vi)  $\int_0^{\frac{\pi}{2}} (x - \sin(x)) dx$

2. James and Kathy are racing on roller skates. They race along a long straight track, and whoever has gone the farthest after 5 seconds wins. If James can skate at a velocity of  $f(t) = 5 + 2t$  ft/sec and Kathy can skate at a velocity of  $g(t) = 10 + \cos\left(\frac{\pi t}{2}\right)$  ft/sec, who is going to win the race?
3. Suppose that the number of hours of daylight in Seattle is modeled by the function  $f(t) = -3.75 \cos\left(\frac{\pi t}{6}\right) + 12.25$ , where  $t$  is given in months. What is the average number of daylight hours in a year?
4. Suppose that a particle moves along a straight line with velocity  $v(t) = |2t - 6|$ . Find the distance travelled in the interval  $[0, 6]$
5. Suppose that a particle moves along a straight line with acceleration  $a(t) = t - 3$ .
- i) Given that the initial velocity is  $v(0) = 3$ , find the velocity of the particle at  $t = 6$ .
  - ii) Find the distance travelled by the particle.