Solutions

Calculus II

Solve the following problems. Wk #1

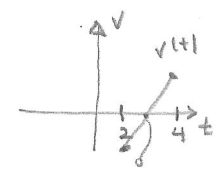
1. Find the derivative of each of the following functions:

$g(x) = \int_0^x \sqrt{t + t^5}\, dt$; $g'(x)=$ $\boxed{x+x^5}$

$h(x) = \int_x^0 \sqrt{t + t^3}\, dt$; $h'(x)=$ $\boxed{-\sqrt{x+x^3}}$

$f(x) = \int_0^{\sin(x)} \sqrt{t + t^3}\, dt$; $f'(x)=$ $\boxed{\sqrt{\sin x + (\sin x)^3} \cdot \cos x}$

2. The velocity function (meters per second) for a particle moving along a line is $v(t) = 2t - 5, 2 \le t \le 4$. Find
(a) the displacement and the distance traveled by the particle in the given interval.



2.5

displacement $\int_2^4 (2t-5)\, dt = \left[t^2-5t\right]_2^4 = (16-20)-(4-10) = \boxed{2}$

distance traveled $\int_2^4 |2t-5|\, dt = \int_2^{2.5} (5-2t)\, dt + \int_{2.5}^4 (2t-5)\, dt = \frac{1}{2}\cdot 1 \cdot \frac{1}{2} + \frac{3}{2}\cdot 3 \cdot \frac{1}{2} = \frac{10}{4} = \boxed{\frac{5}{2}}$

(b) the displacement and the distance traveled by the particle when t varies from 2 to 3.

displacement $\int_2^3 (2t-5)\, dt = \left[t^2-5t\right]_2^3 = (9-15)-(4-10) = -6+6 = \boxed{0}$

distance traveled $\int_2^3 |2t-5|\, dt = \int_2^{2.5} (5-2t)\, dt + \int_{2.5}^3 (2t-5)\, dt = \frac{1}{2}\cdot 1 \cdot \frac{1}{2} + \frac{1}{2}\cdot\frac{1}{2}\cdot 1 = \boxed{\frac{1}{2}}$

3. Use the substitution method to solve the following indefinite integrals:

a. $\int \sqrt{5t+3}\, dt$ Let $u = 5t+3$. Then $du = 5dt$

$\int \sqrt{5t+3}\, dt = \frac{1}{5}\int u^{1/2}\, du = \frac{1}{5}\cdot\frac{2}{3}\, u^{3/2} + C = \boxed{\frac{2}{15}(5t+3)^{3/2} + C}$

b. $\int \frac{2t}{t^2+5}\, dt$ $u = t^2+5$ $du = 2t\, dt$

$\int \frac{2t}{t^2+5}\, dt = \int \frac{1}{u}\, du = \ln|u| + C = \boxed{\ln(t^2+5) + C}$

c. $\int x^2 e^{x^3+5}\, dx$ $u = x^3+5$ $du = 3x^2\, dx$

$\int x^2 e^{x^3+5}\, dx = \frac{1}{3}\int e^u\, du = \frac{1}{3}e^u + C = \boxed{\frac{1}{3}e^{x^3+5} + C}$