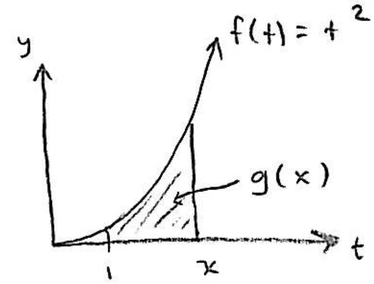
MATH 2 PROBLEM SET # 6 SOLUTIONS

SECTION 5.3

(5.) $g(x) = \int_1^x t^2 \, dt$



(a.) BY PART I OF THE FUNDAMENTAL THEOREM,

$$\boxed{g'(x) = x^2}.$$

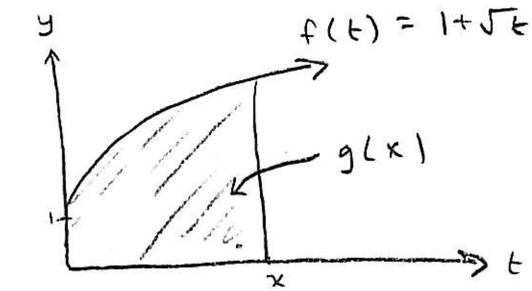
(b.) BY PART II OF THE FUNDAMENTAL THEOREM,

$$\int_1^x t^2 \, dt = F(x) - F(1) = \frac{x^3}{3} - \frac{1^3}{3} = \frac{1}{3}x^3 - \frac{1}{3},$$

USING $F(t) = \dfrac{t^3}{3}$.

THUS $\boxed{g'(x = \dfrac{d}{dx}\left(\dfrac{1}{3}x^3 - \dfrac{1}{3}\right) = x^2}$.

$\boxed{(6.)}$ $g(x) = \int_0^x (1+\sqrt{t}) \, dt$



(a.) BY PART I OF THE FUNDAMENTAL THEOREM,

$$\boxed{g'(x) = 1 + \sqrt{x}}.$$

(b.) BY PART II,

$$g(x) = \int_0^x 1+\sqrt{t} \, dt = \int_0^x 1 + t^{1/2} \, dt$$

$$= F(x) - F(0) = x + \frac{2}{3}x^{3/2}, \quad \text{USING } F(t) = t + \frac{2}{3}t^{3/2}.$$

THUS $\boxed{g'(x) = \dfrac{d}{dx}\left(x + \dfrac{2}{3}x^{3/2}\right) = 1 + x^{1/2} = 1 + \sqrt{x}}$.

(7.) $g(x) = \int_1^x \frac{1}{t^3+1}\, dt$.

$\boxed{g'(x) = \frac{1}{x^3+1}}$ BY PART I OF THE FUNDAMENTAL THEOREM.

(19.) $\int_{-1}^{2} (x^3 - 2x)\, dx = F(2) - F(-1) =$

$\left(\frac{2^4}{4} - 2^2\right) - \left(\frac{(-1)^4}{4} - (-1)^2\right) = \boxed{\frac{3}{4}}$,

USING $F(x) = \frac{x^4}{4} - x^2$ IN PART II.

(21.) $\int_1^4 (5 - 2t + 3t^2)\, dt = F(4) - F(1)$

$= \left(5(4) - (4)^2 + (4)^3\right) - \left(5(1) - (1)^2 + (1)^3\right)$

$= 68 - 5 = \boxed{63}$, USING

$F(t) = 5t - t^2 + t^3$ IN PART II.

$\boxed{(22.)}$ $\int_0^1 \left(1 + \frac{1}{2}u^4 - \frac{2}{5}u^9\right) du = F(1) - F(0)$

BY PART II, WHERE $F(u) = u + \frac{1}{10}u^5 - \frac{1}{25}u^{10}$,

SO IT'S $\left(1 + \frac{1}{10} - \frac{1}{25}\right) - 0 = \frac{53}{50} = \boxed{1.06}$.