Name _____ Per. _____ Date_____ Score _____

(5.3, 5.4) The Fundamental Theorem of Calculus (Definite Integrals) Notes

Fundamental Theorem of Calculus	$\int_a^b f(x)dx = F(b) - F(a)$
Fundamental Theorem of Calculus (Part II)	$g(x) = \int_a^x f(t)dt \;\; then \; g'(x) = f(x) \quad \text{or} \quad \frac{d}{dx}\int_a^x f(t)dt = f(x)$

Solve. Round to the nearest hundredth if irrational.

1) $\int_{-1}^{1}\left(x^3 + x^2 - 2\right)dx$

$\frac{x^4}{4} + \frac{x^3}{3} - 2x \Big|_{-1}^{1}$

$\left(\frac{1}{4} + \frac{1}{3} - 2\right) - \left(\frac{1}{4} - \frac{1}{3} + 2\right)$

$\frac{2}{3} - 4 = \boxed{-\frac{10}{3}}$

2) $\int_0^4 \left(\frac{1}{2}x^2 - 2e^x\right)dx$

$\frac{1}{6}x^3 - 2e^x \Big|_0^4$

$\left(\frac{1}{6}(64) - 2e^4\right) - \left(0 - 2e^0\right)$

$\frac{32}{3} - 2e^4 + 2$

$\boxed{\frac{38}{3} - 2e^4}$

3) $\int_0^{\pi/2}\left(-3\sin x + \cos x\right)dx$

$3\cos x + \sin x \Big|_0^{\pi/2}$

$(3(0) + 1) - (3(1) + 0)$

$\boxed{-2}$

4) $\int_1^4 \left(5 + \sqrt{x}\right)dx$

$5x + \frac{2}{3}x^{3/2} \Big|_1^4$

$\left(20 + \frac{2}{3}(8)\right) - \left(5 + \frac{2}{3}\right)$

$20 + \frac{16}{3} - 5 - \frac{2}{3}$

$15 + \frac{14}{3} = \boxed{\frac{59}{3}}$

Find the derivative of the function.

5) $\frac{d}{dx}\int_0^x (1+\sqrt{t})\,dt$ = $1+\sqrt{x}$

$\frac{d}{dx}\int_0^x (1+t^{1/2})\,dt$

$t+\frac{2}{3}t^{3/2}\Big|_0^x$

$\left(x+\frac{2}{3}x^{3/2}\right)\frac{d}{dx}$

$1+x^{1/2}$

6) $\frac{d}{dx}\left(\int_x^{\cos x} 1\,dt\right)$ =

$t\Big|_x^{\cos x}$

$(\cos x - x)\frac{d}{dx}$

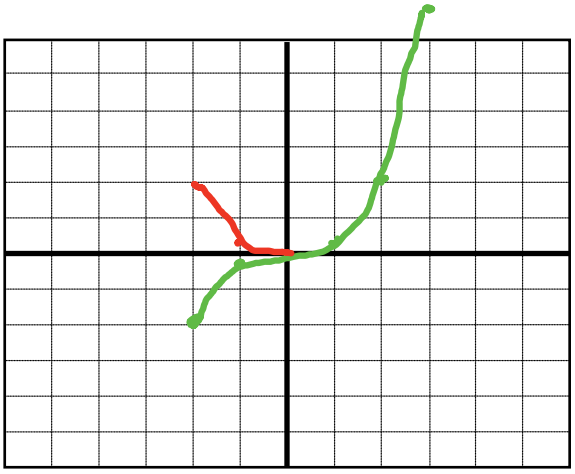
$-\sin x - 1$

Find the total area.

7) $\int_{-2}^{3} |x^3|\,dx$ = $f(x)=x^3$

$\int_0^{-2} x^3\,dx + \int_0^3 x^3\,dx$

$\frac{x^4}{4}\Big|_0^{-2} + \frac{x^4}{4}\Big|_0^3$



$(4-0)+\left(\frac{81}{4}-0\right)$

$\frac{97}{4}$ = 24.25

$\frac{1}{3}+\frac{1}{2}$

$\left(\frac{x^3}{3}+\frac{x^2}{2}-\left(\frac{1}{3}-\frac{1}{2}\right)\right)'\frac{d}{dx}$

x^2+x