Topic 6.7 Fundamental Theorem of Calculus **SHOW ALL WORK ON A SEPARATE SHEET OF PAPER**

Integration

In Exercises 1-4, use $\int_a^b f(x)dx = F(b) - F(a)$. *Find formulas for the functions represented by the definite integrals.* **NOTE:** You are **NOT** taking the derivative.

1. $\int_2^x (12t^2 - 8t)\,dt$
2. $\int_{-\pi/4}^x \sec^2\theta\,d\theta$
3. $\int_1^{x^2} t\,dt$
4. $\int_{3x}^{9x+2} e^{-u}\,du$

Fundamental Theorem of Calculus $\frac{d}{dx}\int_c^{g(x)} f(t)\,dt = f(g(x)) \bullet g'(x)$

In Exercises 5-8, calculate the derivative.

5. $\frac{d}{dx}\int_0^{x^2} \frac{t\,dt}{t+1}$
6. $\frac{d}{dx}\int_1^{1/x} \cos^3 t\,dt$
7. $\frac{d}{ds}\int_{-6}^{\cos s} u^4\,du$
8. $\frac{d}{dx}\int_1^{x^3} \frac{\sin t}{t}\,dt$

Applications of the Fundamental Theorem of Calculus $\frac{d}{dx}\int_c^x f(t)dt$

9. Find $G(1)$, $G'(0)$, and $G''(\pi/4)$, where $G(x) = \int_1^x \tan t\,dt$.

10. Find $H(-2)$ and $H'(-2)$, where $H(x) = \int_{-2}^x \frac{du}{u^2+1}$.

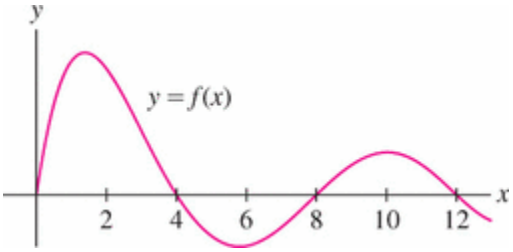
11. Let $F(x) = \int_2^x \frac{t+3}{t-1}dt$. Find $F(2)$, $F'(2)$, and $F''(2)$.

12. $F(x) = \int_2^x \frac{t-2}{t+1}dt$ <u>Show all work</u>.
    a. Find the intervals where $F(x)$ is increasing and decreasing.
    b. Find all critical points and stationary points for $F(x)$.
    c. Find the concavity of $F(x)$.
    d. Find all the inflection points of $F(x)$.

13. $F(x) = \int_2^x t^2 + t - 6dt$
    a. Find $F(0)$
    b. Find $F'(2)$
    c. Find the intervals of concavity.
    d. Identify the location of any inflection points.

14. $F(x) = \int_2^x 4t^2 + 4\ dt$.
    a. Evaluate $F(2)$, $F'(2)$, *and* $F''(2)$.
    b. Find all intervals of increase and decrease
    c. Find all intervals of concavity
    d. Identify any stationary points, relative max/mins, and inflection points.

15. Let $A(x) = \int_0^x f(t)dt$, with $f(x)$ given. Determine



(a) The intervals on which $A(x)$ is increasing and decreasing

(b) The values x where $A(x)$ has a local min or max

(c) The inflection points of $A(x)$

(d) The intervals where $A(x)$ is concave up or concave down