

## Worksheet 7, Tuesday, April 5th, 2022

**Limit Definition of the Definite Integral**

1. Show that  $\int_1^5 7 - x - x^2 dx = \boxed{-\frac{76}{3}}$  using two different methods:

- (a) Fundamental Theorem of Calculus
- (b) Limit Definition of the Definite Integral.

**Differentiation**

2. Compute  $g'(x)$  where  $g(x) = \int_x^2 \frac{\cos t}{5 + \cos t} dt$

**Integration** Evaluate each of the following integrals:

$$3. \int_0^4 \frac{1-x}{\sqrt{x}} dx \qquad 4. \int x^4 (2 - 3x^5)^6 dx \qquad 5. \int_9^{64} \frac{5}{\sqrt{x}\sqrt{1+\sqrt{x}}} dx$$

$$6. \int_0^{\frac{\pi}{6}} \frac{\cos x}{(1 + 6 \sin x)^2} dx \qquad 7. \int \frac{5}{x^2 \left(5 + \frac{3}{x}\right)^{\frac{3}{5}}} dx \qquad 8. \int x(x-2)^{\frac{3}{4}} dx$$

**Initial Valued Problem**

9. Find the function  $f(x)$  that satisfies  $f'(x) = \frac{\sec^2 x}{\sqrt{3 + \tan x}}$  and  $f\left(\frac{\pi}{4}\right) = -5$

**Displacement–Total Distance**

10. Consider an object moving on the number line such that its Velocity at time  $t$  is  $v(t) = \sin t$  feet per second. Also assume that  $s(0) = 2$  feet, where as usual  $s(t)$  is the Position of the object at time  $t$ .

- (a) Compute the Acceleration function  $a(t)$  and the Position function  $s(t)$ .
- (b) Draw the graph of  $v(t)$  for  $0 \leq t \leq 2\pi$ , and explain why the object is *not* always moving to the right.
- (c) Draw the graph of  $|v(t)|$  for  $0 \leq t \leq 2\pi$ .
- (d) Set-Up, but do not compute, the Definite Integral that represents each of the **Displacement** and **Total Distance** traveled for  $0 \leq t \leq 2\pi$ . Think about how to compute these definite integrals.

**Turn in your own solutions.**