

Math 112: Calculus B

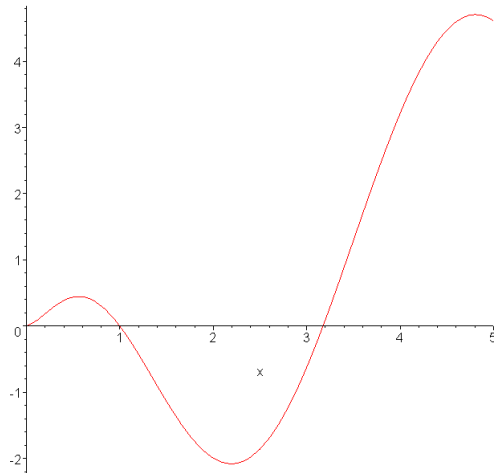
The Fundamental Theorem of Calculus

---

The Area Function

---

1. Given below is the graph of  $f(x)$ . If  $A_f(x) = \int_0^x f(t) dt$



a. Determine on which interval  $A_f$  is increasing.

b. Determine on which interval  $A_f$  is decreasing.

c. Determine on which interval  $A_f$  is concave up.

d. Determine on which interval  $A_f$  is concave down.

Math 112: Calculus B

The Fundamental Theorem of Calculus

---

Fundamental Theorem Part I

---

1. Let  $f(x) = 2xe^{x^2}$  and  $A_f(x) = \int_0^x f(t) dt$ . Find the symbolic formula for  $A_f$ .

2. Let  $f(x) = x^2 + x$  and  $A_f(x) = \int_1^x f(t) dt$ . Find the symbolic formula for  $A_f$ .

Math 112: Calculus B

The Fundamental Theorem of Calculus

---

Fundamental Theorem Part I

---

Evaluate each of the following

1.  $\frac{d}{dx} \int_0^x \sqrt{t^2 + 1} dt$

2.  $\frac{d}{dt} \int_2^t \frac{s^3 - 1}{2s^2 + s - 1} ds$

3.  $\frac{d}{dt} \int_t^{-3} \sin^2(x) dx$

Math 112: Calculus B

The Fundamental Theorem of Calculus

---

Fundamental Theorem Part I: Chain Rule

---

Evaluate each of the following

1.  $\frac{d}{dt} \int_0^{t^2} \cos(x^2) dx$

2.  $\frac{d}{dt} \int_{-2t}^t \frac{1}{1+x^2} dx$

Math 112: Calculus B

The Fundamental Theorem of Calculus

---

Fundamental Theorem Part II

---

Evaluate each of the following

1.  $\int_{-2}^1 (x^2 + 2x + 1) dx$

2.  $\int_0^{\frac{\pi}{6}} \cos(x) dx$

3.  $\int_0^1 e^x dx$

4.  $\int_1^2 \frac{x^3 - 4}{x} dx$