Section 5.6 – The Fundamental Theorem of Calculus (Part 2)

56. a. Use a graphing utility to generate the graph of

$$f(x) = \frac{1}{100}(x+2)(x+1)(x-3)(x-5)$$

And use the graph to make a conjecture about the sign of the integral $\int_{-2}^{5} f(x)dx$.

b. Check your conjecture by evaluating the integral.

57. Define F(x) by $F(x) = \int_1^x (3t^2 - 3)dt$

a. Use Part 2 of the Fundamental Theorem of Calculus to find F'(x).

b. Check the result in part (a) by first integrating and then differentiating.

58. Define F(x) by $F(x) = \int_{\pi/4}^{x} \cos 2t\, dt$

a. Use Part 2 of the Fundamental Theorem of Calculus to find F'(x).

b. Check the result in part (a) by first integrating and then differentiating.

Use Part 2 of the Fundamental Theorem of Calculus to find the derivatives.

59. a. $\frac{d}{dx}\int_1^x \sin(t^2)\, dt$ b. $\frac{d}{dx}\int_1^x e^{\sqrt{t}}\, dt$

61. $\frac{d}{dx}\int_x^0 t \sec t\, dt$ 62. $\frac{d}{du}\int_0^u |x| dx$

64. Let $F(x) = \int_{\sqrt{3}}^{x} \tan^{-1} t\, dt$. Find

a. $F(\sqrt{3})$ b. $F'(\sqrt{3})$ c. $F''(\sqrt{3})$

65. Let $F(x) = \int_0^x \frac{t-3}{t^2+7} dt$ for $-\infty < x < \infty$.

a. Find the value of *x* where F attains its minimum value.

b. Find the intervals over which F is only increasing or only decreasing.

c. Find open intervals over which F is only concave up or only concave down.

67. a. Over what open interval does the formula $F(x) = \int_1^x \frac{dt}{t}$ represent an antiderivative of $f(x) = \frac{1}{x}$

b. Find a point where the graph of F crosses the x-axis.