

Mathematics 170

Tutorial Worksheet #4

Wed. Jan 25, 2006 - Tues. Jun 31, 2006

1. Use the Fundamental Theorem of Calculus to evaluate these integrals:

(a) $\int_{25}^{36} \sqrt{x} \, dx$

(b) $\int_2^8 \sqrt{2x} \, dx$

(c) $\int_0^{20} \sqrt{3x+4} \, dx$

(d) $\int_0^{\pi/4} [3\cos(t) - 2\sec^2(t)] \, dt$

2. Find the areas of the following regions. Begin by sketching the regions.

(a) The region bounded between the X-axis, the lines $x=1$ and $x=4$, and the curve $y=4x^3$

(b) The region bounded between the X-axis, the lines $x=1$ and $x=4$, and the curve $y=4x^3-400$

(c) The region bounded between the X-axis, the lines $x=0$ and $x=4$, and the curve $y=4x^3-4$

3. Evaluate these derivatives:

(a) $\frac{d}{dx} \left(\int_0^{x^2} \sqrt{1+y^3} \, dy \right)$ when $x = \sqrt{2}$

$$(b) \frac{d}{dx} \left(\int_{3x}^1 \sin\left(\frac{\pi t^2}{2}\right) dt \right)$$

$$(c) \frac{d}{dx} \left(\int_{2x+1}^{3x+2} e^{-t^2} dt \right)$$

4. Compute $\lim_{x \rightarrow 0} \left[\frac{\int_0^x \ln(1+t) dt}{x^2} \right]$

5. Evaluate these indefinite integrals:

$$(a) \int (3x^5 - 2 \sin x + \frac{1}{x}) dx$$

$$(b) \int \frac{(x^2+1)^3}{x} dx$$

6. If $F'(x) = \frac{3x^2+1}{\sqrt{x}}$ and $F(4)=5$, what is the value of $F(1)$?

Some Answers

$$1(a) \frac{182}{3} \quad 1(b) \frac{56}{3} \quad 1(c) 112 \quad 1(d) \frac{3\sqrt{2}-4}{2}$$

$$2(a) 255 \text{ sq. units} \quad 2(b) 945 \text{ sq. units} \quad (c) 246 \text{ sq. units} \quad 3(a) 6\sqrt{2}$$

$$4. \frac{1}{2} \quad 6. -\frac{71}{5} \quad (\text{Answers are not guaranteed correct.})$$