

Name Solutions (Dylan Zwick) Date 6/8/09

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. Evaluate

$$\int_0^{\sqrt{\pi}} (3x \sin(x^2)) dx \quad (3 \text{ points})$$

$$u = x^2, \quad du = 2x dx \Rightarrow \frac{3}{2} du = 3x dx$$

$$= \int_0^{\pi} \frac{3}{2} \sin(u) du = -\frac{3}{2} \cos(u) \Big|_0^{\pi} = \frac{3}{2} - \left(-\frac{3}{2}\right) = \boxed{3}$$

Answer 1: $\boxed{3}$ 2. Find the average value of $f(x) = 3x^2 + 4x - 1$ on $[0, 2]$. (4 points)

$$\frac{1}{2} \int_0^2 (3x^2 + 4x - 1) dx$$

$$= \frac{1}{2} [x^3 + 2x^2 - x] \Big|_0^2$$

$$= \frac{1}{2} (8 + 8 - 2) = 4 + 4 - 1 = \boxed{7}$$

Answer 2: $\boxed{7}$

(Note: #3 and 4 are on the back!)

3. Evaluate.

$$\int_4^5 \frac{x \sec^2(\sqrt{x^2-16})}{\sqrt{x^2-16}} dx \quad (5 \text{ points})$$

$$\begin{aligned} u &= \sqrt{x^2-16} \\ du &= \frac{x}{\sqrt{x^2-16}} dx \\ &= \int_0^3 \sec^2(u) du \\ &= \tan(u) \Big|_0^3 \\ &= \tan(3) - \tan(0) \\ &= \tan(3) \end{aligned}$$

Answer 3:

$$\boxed{\tan(3)}$$

4. Find $G'(x)$ given $G(x) = \int_3^x t^2(t^3-5) dt$ (3 points)

$$G'(x) = x^2(x^3-5)$$

Answer 4:

$$\boxed{x^2(x^3-5)}$$