MATH 12002 EXAM #4 Spring 2005

1. Find f if $f''(x) = 3x - \cos 2x$, $f'(0) = 4$ and $f(0) = -7$.

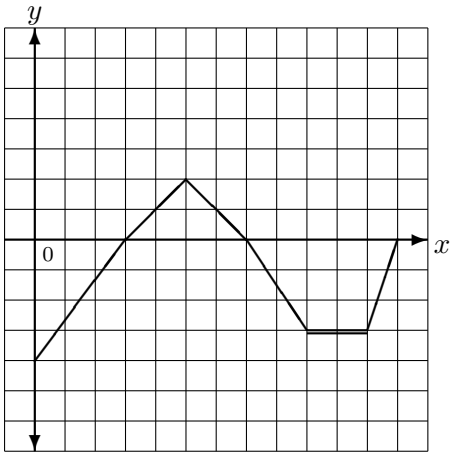
2. Let $f(x) = 3x^2 - 4x - 1$. Find the average value of f over the interval $[2, 4]$.

3. Use Part I of the Fundamental Theorem of Calculus to find the derivative of the function

$$h(x) = \int_{2-7x}^{3} \frac{t^2}{1+t}\, dt$$

4. Using complete sentences, state the definition of the definite integral. Please be sure to include all important details.

5. The graph of f is given below. Evaluate each integral by interpreting it in terms of areas.



(a) $\displaystyle\int_0^3 f(x)\, dx$

(b) $\displaystyle\int_3^7 f(x)\, dx$

(c) $\displaystyle\int_7^{12} f(x)\, dx$

(d) $\displaystyle\int_0^{12} f(x)\, dx$

6. Evaluate each integral or state why it does not exist.

(a) $\displaystyle\int \frac{\sin 3\theta}{\cos^5 3\theta}\, d\theta$

(b) $\displaystyle\int x\sqrt{x-1}\, dx$

(c) $\displaystyle\int 3x^4 \sqrt[3]{2x^5 - 3}\, dx$

(d) $\displaystyle\int_{-4}^{4} |x+2|\, dx$

(e) $\displaystyle\int_1^4 \frac{2t^2 + \sqrt{t^3} - 3}{t^2}\, dt$

7. Find the area of the curve bounded by $y = x^2 - 2x$ and $y = 3x - 4$.

8. (**SET UP ONLY**) Find the area of the shaded region for $y = -\cos x$ and $y = \sin 2x$.

ANSWERS

1. $f(x) = \frac{1}{2}x^3 + \frac{1}{4}\cos 2x + 4x - \frac{29}{4}$
2. 15
3. $\frac{7(2-7x)^2}{3-7x}$
4. see handout
5. (a) -6
   (b) 4
   (c) $-\frac{21}{2}$
   (d) $2\pi - \frac{33}{2}$
6. (a) $\frac{1}{12}(\cos 3\theta)^{-4} + C$
   (b) $\frac{2}{5}(x-1)^{5/2} + \frac{2}{3}(x-1)^{3/2} + C$
   (c) $\frac{9}{40}(2x^5 - 3)^{4/3} + C$
   (d) 20
   (e) $\frac{23}{4}$
7. $\frac{9}{2}$
8. $\int_0^{\pi/2} (\sin 2x + \cos x)\,dx + \int_{\pi/2}^{7\pi/6} (-\cos x - \sin 2x)\,dx$