

Math C077 Instructor: _____ Your Name: _____

MATH C077 FINAL EXAM **SPRING 2006** **May 4, 2006**

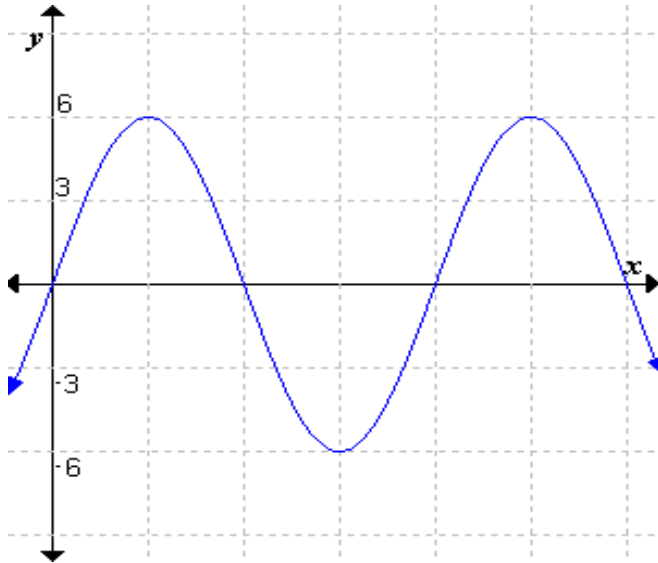
This exam consists of 6 questions.

SHOW ALL YOUR WORK! NO WORK, NO CREDIT.

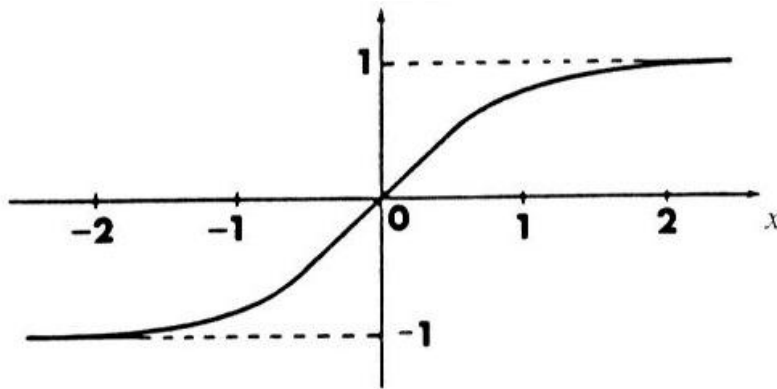
Question	Points	Out of
1		9
2		39
3		16
4		9
5		15
6		12
Total		100

1. Sketch the graph of the derivative function $f'(x)$ in the same axis in the following cases:

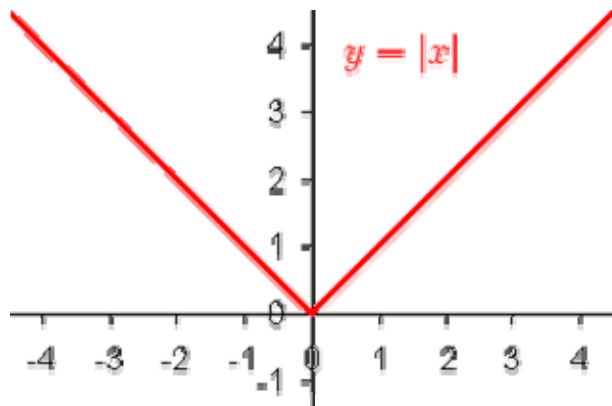
a) (3 points)



b) (3 points)



c) (3 points)



2. (3 points each) Let $f(x) = x^2 - 2x$.

a) Estimate $f'(3)$ using $h = 0.03$.

b) Find the exact value for $f'(3)$.

c) Give the equation of the tangent line to $f(x)$ at $x = 3$.

d) Use the tangent line to estimate $f(2.98)$.

e) List all critical points for $f(x)$.

f) Use the first derivative test to decide which critical points are local maxima, local minima or inflection points of $f(x)$.

g) Use the second derivative test to decide which critical points are local maxima, local minima or inflection points of $f(x)$.

h) List the global maxima and minima of $f(x)$ on the interval $[0,3]$.

i) List all inflection points of $f(x)$. If there are no inflection points state the concavity of the function.

j) Estimate $\int_1^7 f(x)dx$. Using LHS and RHS and a width of the interval $\Delta x = 2$

k) Give two possible antiderivatives for $f(x)$.

l) Give the exact value for $\int_1^7 f(x)dx$.

m) Give the average value of $f(x)$ on the interval $[1,7]$.

3. Given $f(1) = 7$, $f'(1) = 5$, $f(6) = 8$, $f'(6) = 3$, $g(6) = 1$, $g'(6) = 5$, $g(8) = 6$ and $g'(8) = 4$ find:

a) (2 points) $h(6)$ if $h(x) = f(g(x))$.

b) (3 points) $h'(6)$ if $h(x) = f(g(x))$.

c) (2 points) $h(6)$ if $h(x) = g(f(x))$.

d) (3 points) $h'(6)$ if $h(x) = g(f(x))$.

e) (3 points) $h'(6)$ if $h(x) = \frac{f(x)}{g(x)}$.

f) (3 points) $h'(6)$ if $h(x) = f(x) \cdot g(x)$

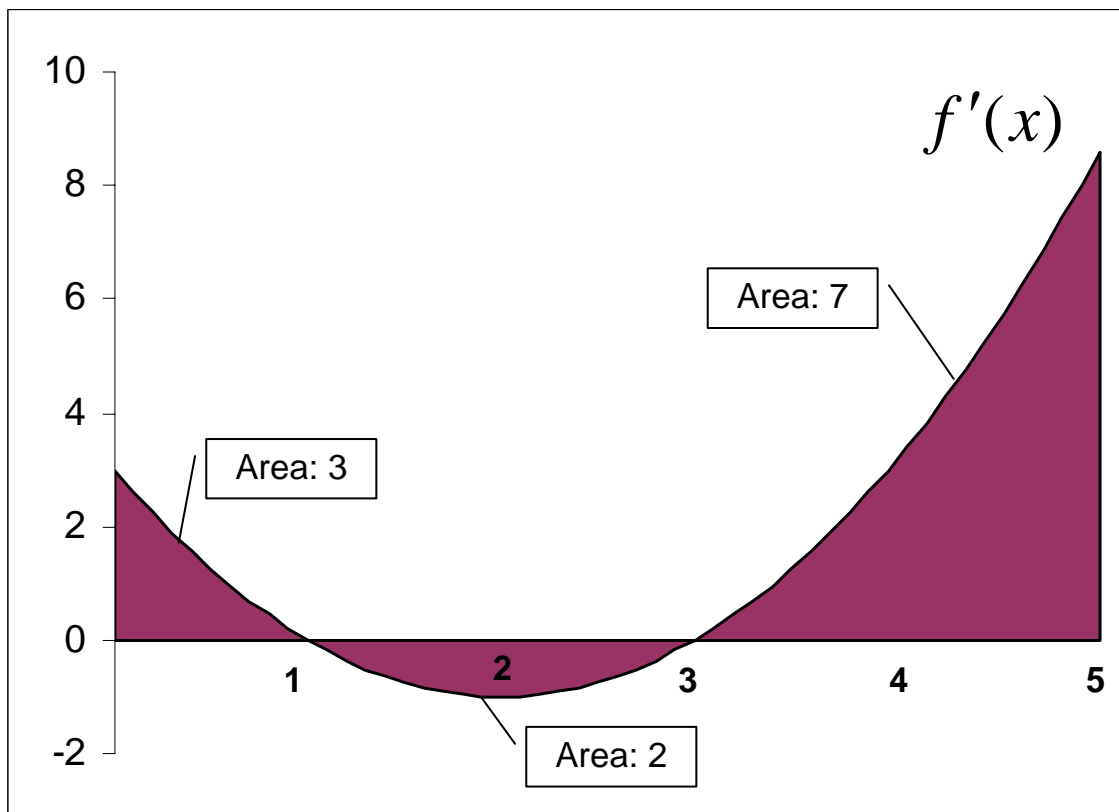
4. (3 points each) Use the rules for differentiation to find the derivative of each of the given functions. Do not simplify.

(b) $g(x) = \ln(\sqrt{x})$

(c) $h(x) = x^e + e^x + e + \pi^x$

(d) $i(x) = \frac{\sin x}{x + 1}$

5. (3 points each) The graph below is the graph of $f'(x)$ (The derivative function of $f(x)$).



a) List all critical points of $f(x)$ on $[0, 5]$.

b) Decide if the critical points of $f(x)$ on $[0,5]$ are local maxima, local minima or inflection points.

c) List all inflection points of $f(x)$ on $[0,5]$.

d) If $f(0) = -1$, calculate $f(1)$, $f(3)$ and $f(5)$ using the Fundamental theorem of Calculus.

e) Sketch the graph of $f(x)$ on the same axis as the graph above.

6. (3 points each) Evaluate each of the following definite or indefinite integrals.

$$(a) \int \left(x^3 - \frac{8}{x} \right) dx$$

$$(b) \int \frac{x}{x^2 + 4} dx$$

$$(c) \int x^2 e^{x^3} dx$$

$$(d) \int_{-1}^1 (x-2)^3 dx$$