

SAMPLE FINAL
MAT 122
12/17/02

Name

Sec.

ID number

TA's name

1	2	3	4	5	6	total
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THIS EXAM IS WORTH 80 POINTS. PUT ALL ANSWERS IN THE SPACE PROVIDED.

1. (2 points each, 20 points total): For items (a) - (g), find the derivative of the given function.

(a) $f(x) = x^{10}$,

$\frac{d}{dx}f(x) =$

(b) $f(x) = \frac{1}{x} + \frac{1}{x^2}$,

$\frac{d}{dx}f(x) =$

(c) $f(x) = \ln x$,

$\frac{d}{dx}f(x) =$

(d) $f(x) = 2^x,$

$\frac{d}{dx}f(x) =$

(e) $f(x) = x^{3/2} + x^{2/3},$

$\frac{d}{dx}f(x) =$

(f) $f(x) = x^2e^x,$

$\frac{d}{dx}f(x) =$

(g) $f(x) = \frac{\ln x}{1+x^2},$

$\frac{d}{dx}f(x) =$

For items (h)-(j), find the second derivative function.

(h) $f(x) = (1 + x^7)^3$,

$$f''(x) =$$

(i) $f(x) = e^{x^2+x^3}$,

$$f''(x) =$$

(j) $f(x) = \ln(x^2+e^x)$,

$$f''(x) =$$

2. (2 points each, 20 points total): For items (a) - (g), find some anti-derivative of the given function.

(a) $f(x) = x^5$,

$$\int f(x)dx =$$

(b) $f(x) = e^{2x}$,

$$\int f(x)dx =$$

(c) $f(x) = \frac{1}{x}$,

$\int f(x)dx =$

(d) $f(x) = 2x^3 + x$,

$\int f(x)dx =$

(e) $f(x) = e^{x^2} 2x$,

$\int f(x)dx =$

(f) $f(x) = x^2 \sqrt{1+x^3}$,

$\int f(x)dx =$

(g) $f(x) = \frac{e^x}{1+e^x}$,

$\int f(x)dx =$

For items (h)-(j), use the fundamental theorem of calculus to evaluate the integral.

(h) $\int_0^1 x^3 dx,$

(i) $\int_{-1}^1 e^{2x} dx,$

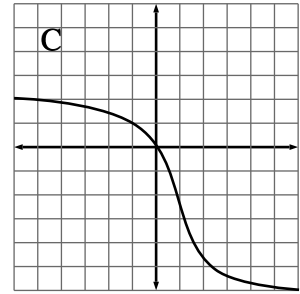
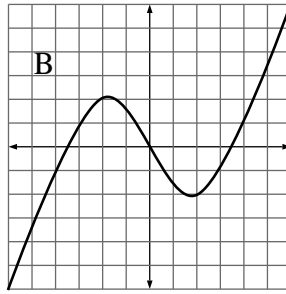
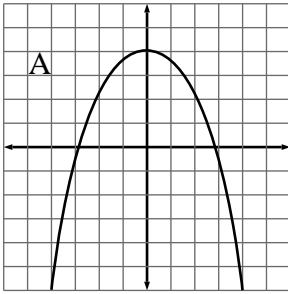
(j) $\int_1^2 x\sqrt{1+x^2} dx,$

3. **Part A (5 points total, 1 point each):** The graph of a different the function f is given in each of the figures below. For each graph sketch the corresponding function g indicated below on the same axes.

For A, $g(x) = f(2x)$.

For B, $g(x) = f(x - 3)$.

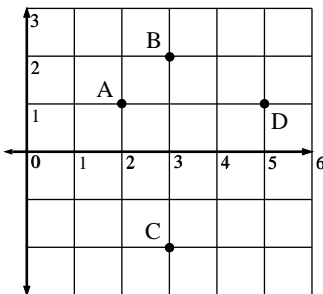
For C, $g(x) = f(-x)$.



Which of the graphs above (A to C) are even functions?

Which of the graphs above (A to C) are odd functions?

- Part B (5 points):** Let L_1 be the line passing through points A and B . Let L_2 be the line passing through points C and D . Find the equations of these lines and the point where they intersect.



4. (10 points total, 1 point each): The DERIVATIVE of f is graphed below. Answer the questions about f .

(i) At what interior points does f have a local maximum?

(ii) If $f(0) = 0$, what is $f(2)$?

(iii) What are the inflection points of f ?

(iv) Which is larger: $f''(5.5)$ or $f''(6.5)$?

(v) Which is largest: $f(1)$, $f(4)$ or $f(7)$?

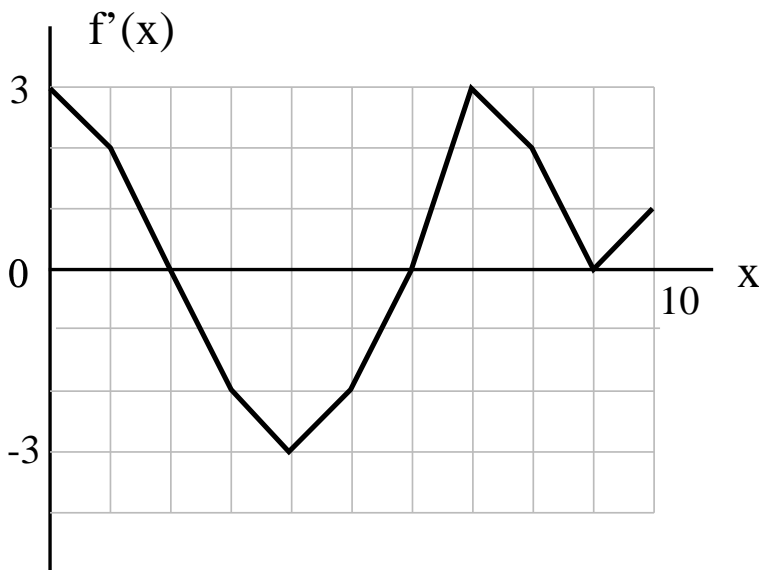
(vi) At which endpoints does f have a local maximum?

(vii) Evaluate $\int_0^6 f'(x)dx$.

(viii) Evaluate $\int_4^7 f''(x)dx$.

(ix) What is the maximum value of $f'(x)$?

(x) Is f concave down on the interval $0 \leq x \leq 4$?



5. **Part A (5 points):** Use the following table to estimate $\int_0^{25} f(x)dx$ using the left hand rule.

x	0	5	10	15	20	25
f(x)	10	8	6	5	4	3

Part B (5 points): A grapefruit is tossed straight up in the air with an initial velocity of 50 ft/sec. The grapefruit is 5 ft above the ground when released. Its height at time t is given by

$$y = -16t^2 + 50t + 5.$$

How high does it go before returning to the ground?

6. **Part A (5 points):** The total cost in dollars to produce q units of a product is $C(q)$. The fixed costs are \$500. The marginal cost is

$$C'(q) = q^2 - 50q + 700.$$

Find the total cost to produce 50 units of the product.

Part B (5 points): Find the area under the graph of $f(x) = \frac{1}{1+x}$ between $x = 0$ and $x = 2$.