SAMPLE FINAL
MAT 122
12/17/02

Name	Sec.

ID number	TA's name

1	2	3	4	5	6	total

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) $f(x) = 2^x$, $\boxed{\frac{d}{dx}f(x) = \qquad\qquad}$

(e) $f(x) = x^{3/2} + x^{2/3}$, $\boxed{\frac{d}{dx}f(x) = \qquad\qquad}$

(f) $f(x) = x^2 e^x$, $\boxed{\frac{d}{dx}f(x) = \qquad\qquad}$

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

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

(h) $f(x) = (1 + x^7)^3$, $\boxed{f''(x) = \qquad}$

(i) $f(x) = e^{x^2+x^3}$, $\boxed{f''(x) = \qquad}$

(j) $f(x) = \ln(x^2+e^x)$, $\boxed{f''(x) = \qquad}$

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

(a) $f(x) = x^5$, $\boxed{\int f(x)dx = \qquad}$

(b) $f(x) = e^{2x}$, $\boxed{\int f(x)dx = \qquad}$

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

(d) $f(x) = 2x^3 + x$, $\boxed{\int f(x)dx =}$

(e) $f(x) = e^{x^2} 2x$, $\boxed{\int f(x)dx =}$

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

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

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

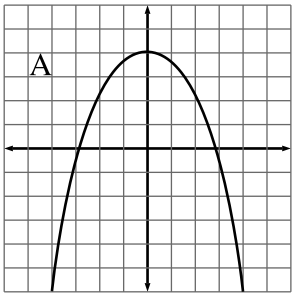
(h) $\int_0^1 x^3 dx$,

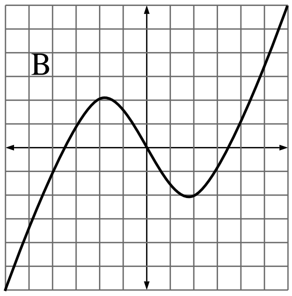
(i) $\int_{-1}^1 e^{2x} dx$,

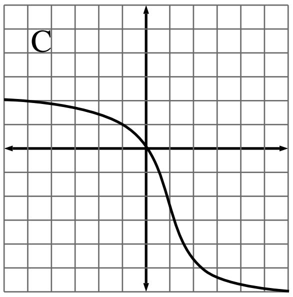
(j) $\int_1^2 x\sqrt{1+x^2} dx$,

3. **Part A (5 points total, 1 points 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, $g(x) = f(-x)$.



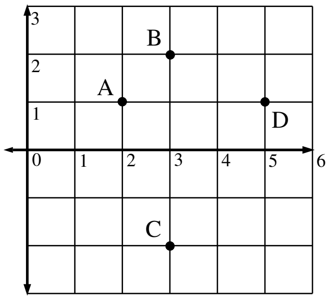




$\boxed{}$ Which of the graphs above (A to C) are even functions?

$\boxed{}$ Which of the graphs above (A to C) are odd functions?

Part B (5 points): Let L_1 be the line pasing 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 intesect.



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 $f(7)$?

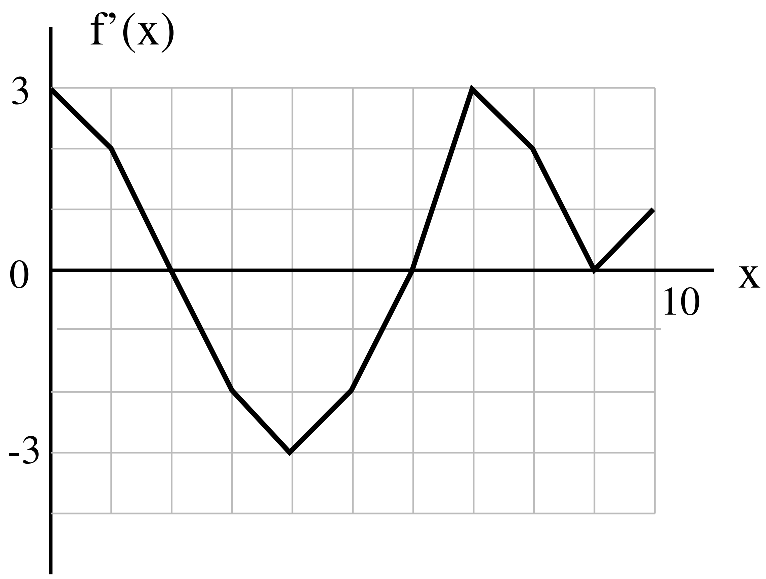
(vi) ☐ At which endpoints does f have a local maximum?

(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 inital 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 $x = 2$.