NAME ______________________________ Rec. Instructor: __________________

Signature ______________________________ Rec. Time ____________

#1	#2	#3	#4	#5	#6	#7	#8	#9	Total
12	9	12	18	16	12	5	8	8	100

CALCULUS I - EXAM 3 - SPRING 2019
April 11, 2019

Show all work for full credit. No books, notes or calculators are permitted. The point value of each problem is given in the left-hand margin. No need to simplify derivatives or integrals.

(12) 1. $$f(x) = x^3 - 12x + 4$$

a) f is decreasing on ________________.

b) f has a local maximum at $x =$ ______________.

c) f is concave up on ________________.

d) f has an inflection point at $x =$ ______________.

(9) 2. Find the absolute maximum and absolute minimum value on $[-3, 1]$ for

$$f(x) = x^4 - 8x^2 + 4.$$

Absolute maximum $=$ _____ at $x =$ _____.

Absolute minimum $=$ _____ at $x =$ _____.

(12) 3. Evaluate the limits at infinity.

a) $\displaystyle\lim_{x\to-\infty} \frac{x^2 - 3x^3 + 1}{x^3 + 2x - 1} =$

b) $\displaystyle\lim_{x\to\infty} \frac{x^2 + x - 9}{x^3 - 5x + 6} =$

c) $\displaystyle\lim_{x\to-\infty} \frac{\sqrt{4x^2 + 3}}{x + 3} =$

(18) 4. The function f and its first and second derivatives are given:

$$f(x) = \frac{x^2-1}{x^2-4}, \qquad f'(x) = \frac{-6x}{(x^2-4)^2}, \qquad f''(x) = \frac{6(3x^2+4)}{(x^2-4)^3},$$

Obtain the following information. Write NONE when appropriate.

(a) x-intercepts:__________________, y-intercepts:______________.

(b) Vertical asymptotes: __________. Horizontal asymptotes: __________.

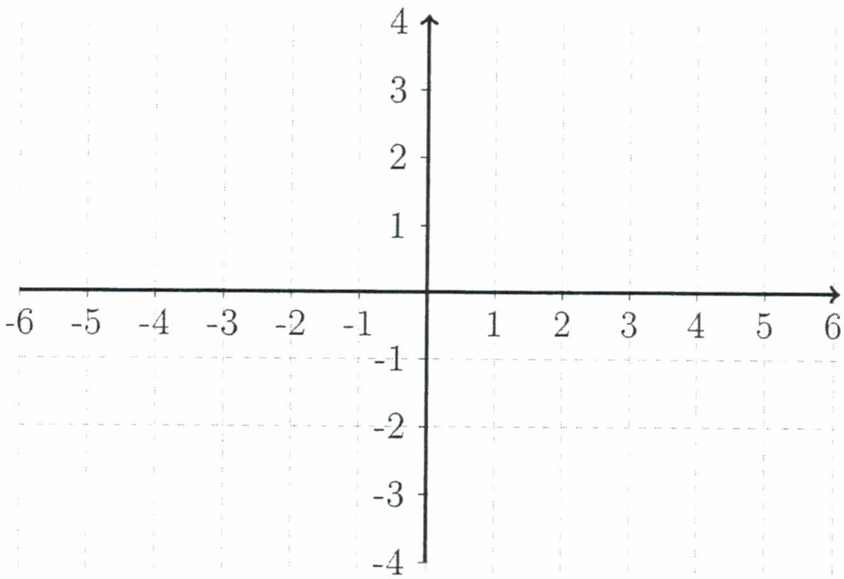
(c) Increasing on: ____________________, decreasing on: ____________________.

(d) Coordinates of local maxima: _____________, local minima: _____________.

(e) Concave upwards on: ____________________, downwards on: ____________________.

(f) Coordinates of inflection points: _____________ .

(g) Use this information to sketch the graph of f



(16) 5. Evaluate the limits

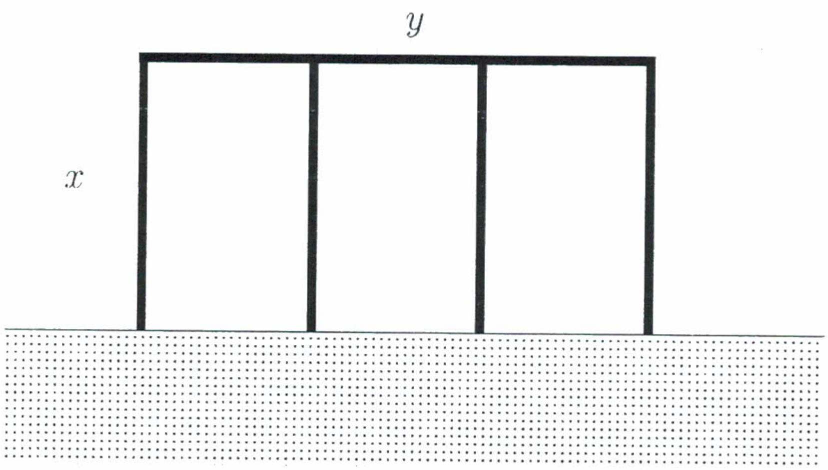
a) $\lim_{x \to 0} \dfrac{x^2 + 4x}{x + \sin x}$

b) $\lim_{x \to 0} \dfrac{e^{3x} - 1 - 3x}{x^2}$

c) $\lim_{x \to \infty} x \ln\left(1 + \dfrac{2}{x}\right)$

d) $\lim_{x \to \infty} x^{3/x}$

(12) 6. You have 4000 feet of fencing to enclose three adjacent rectangular pens next to a river. No fence is needed along the river. Find the dimensions x and y that maximize the area enclosed.



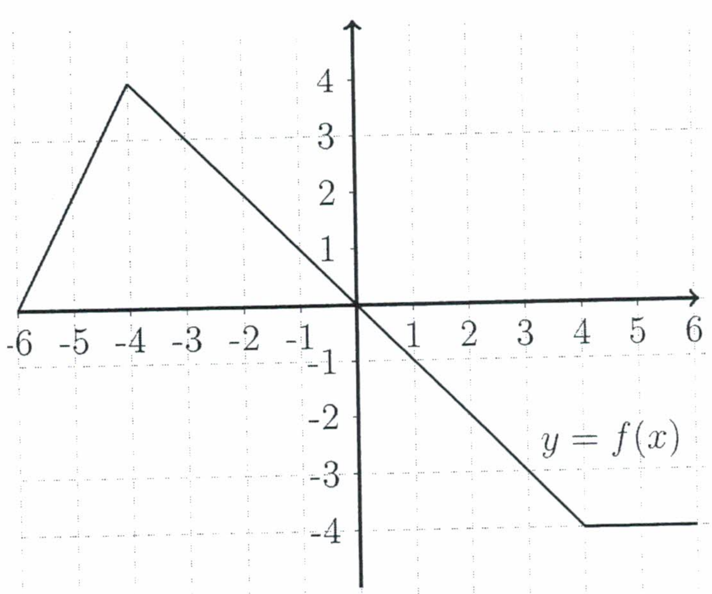
(5) 7. Solve the initial value problem: $f'(x) = 3x^2 - 4x + 5, \ f(1) = 3$.

(8) 8. Find the indicated antiderivatives

a) $\int 3\sqrt{x} + 2\sin x \ dx$

b) $\int \frac{3}{x^2} + 4e^{2x} \ dx$

(8) 9. For the function f graphed below evaluate the definite integrals



a) $\int_{-4}^{0} f(x) \ dx =$ ________

b) $\int_{-2}^{4} f(x) \ dx =$ ________