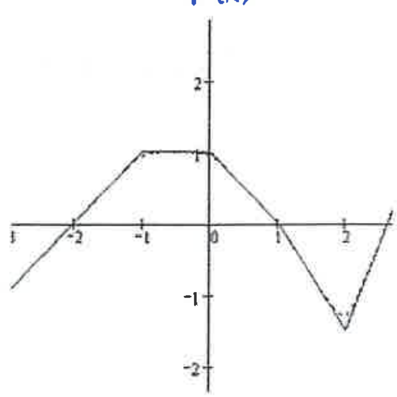
Practice: If f(x)=2cos(x)-x, write a linearization of the function at x=0 and use that linearization to approximate the value of f(x) at x=-0.1

- So… is that linearization an over or underestimate of the actual value of f(-0.1)? Explain.

Homework

1. Use the graph of f'(x) at left to answer the following questions & **justify**.



a. How many and what type of extrema does f(x) have?
Local min on f(x) at x = -2 and x = 2.6 b/c f'(x) changes − → +
local max on f(x) at x = 1 b/c f'(x) changes + → −.

b. How many horizontal tangents does f have and where do they occur?
f(x) has three horizontal tangents (at x = -2, 1, 2.6) b/c f'(x) = 0

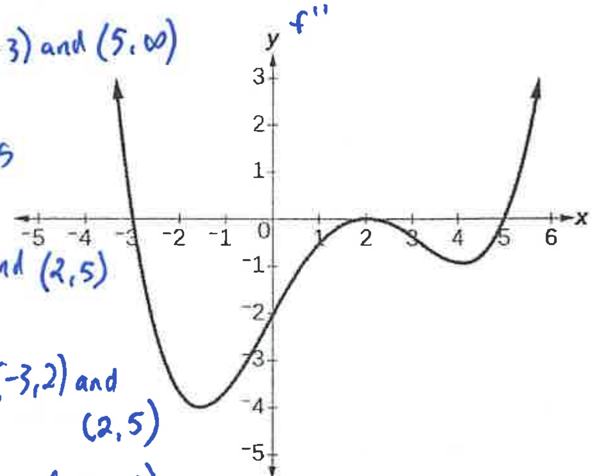
c. On what interval(s) is f''(x)>0 ?
f''(x) > 0 when f'(x) is increasing: (-3, -1) and (2, 2.7)

d. On what interval(s) is f(x) decreasing?
f(x) decreases when f'(x) is negative: (-3, -2) and (1, 2.6)

e. On what interval(s) is f(x) concave down?
f(x) is concave down when f'(x) is decreasing: (0, 1) and (1, 2)

f. Where does f(x) have a point of inflection?
f(x) has a point of inflection when f'(x) changes from increasing to decreasing or vice versa: this happens only at x = 2. We ignore the flat area!

2. Use the graph of f''(x) at left to answer the following questions & **justify**.



a. On what interval(s) is f(x) concave up?

f(x) is concave up when f'' is positive: $(-\infty, -3)$ and $(5, \infty)$

b. Where does f(x) have points of inflection?

f(x) has points of inflection at $x=-3$ and $x=5$ b/c f''(x) changes sign

c. On what interval(s) is f''(x)<0 ?

f''(x)<0 when f''(x) is negative: $(-3, 2)$ and $(2, 5)$

d. On what interval(s) is f'(x) decreasing?

f'(x) is decreasing when f''(x) is negative: $(-3, 2)$ and $(2, 5)$

e. On what interval(s) is f'(x) increasing?

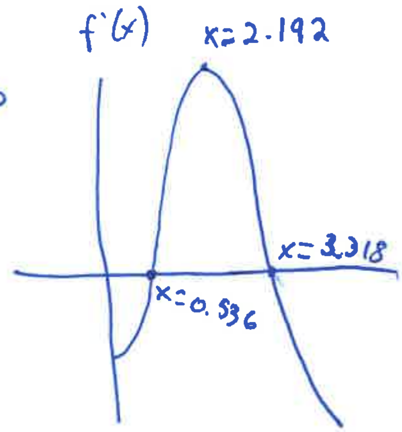
f'(x) is increasing when f''(x) is positive: $(-\infty, -3)$ and $(5, \infty)$

Calc ok: The function f '(x), the derivative of f, is given by $f'(x) = -2 + (x^2 + 3x)^{\frac{6}{5}} - x^3$ on the interval [0, 5]. Use that information to answer the following questions and **justify**.

a. How many and what type of extrema does f(x) have?

Local min on f(x) at $x=0.536$ b/c f'(x) changes $- \to +$.

Local max on f(x) at $x=3.318$ b/c f'(x) changes $+ \to -$.



b. How many horizontal tangents does f have and where do they occur?

Horizontal tangents on f(x) at $x=0.536$ and 3.318 b/c $f'(x)=0$

c. On what interval(s) is f''(x)>0 ?

f''(x)>0 when f'(x) is increasing: $(0, 2.192)$

d. On what interval(s) is f(x) decreasing?

f(x) is decreasing when f'(x) is negative: $[0, 0.536)$ and $(3.318, 5]$

e. On what interval(s) is f(x) concave down?

f(x) is concave down when f'(x) is decreasing: $(2.192, 5)$

f. Where does f(x) have a point of inflection?

f(x) has a Point of Inflection when f'(x) changes from increasing to decreasing or vice versa: at $x=2.192$

g. On what interval(s) is f(x) increasing and concave down.

f(x) is increasing and concave down when f'(x) is positive and decreasing: $(2.192, 3.318)$