

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1.  $f(x) = 2x^4 - 5x^3$

(4 marks)

- a) Find the intervals where  $f$  is increasing and where  $f$  is decreasing.
- b) Find the intervals where  $f$  is concave up and where  $f$  is concave down.
- c) List any inflection points.

2.  $f(x) = xe^{x^2}$

(4 marks)

- a) Find the intervals where  $f$  is increasing and where  $f$  is decreasing.
- b) Find the intervals where  $f$  is concave up and where  $f$  is concave down.
- c) List any inflection points.

3. Are the following true or false?

(1/2 mark each)

a) If  $f'(x) > 0$  on the open interval  $(a, b)$  then  $f(x)$  is increasing on  $(a, b)$ .

b) If  $f''(x) < 0$ , then  $f(x) < 0$ .

c) If  $f''(x) = 0$ , then  $x$  is a point of inflection.

d) If  $f''(x) > 0$ , then  $f'(x)$  is increasing.

4. Sketch a curve having the following properties: (3 marks)

$$f(3) = 2, f''(x) < 0 \text{ for } x \neq 3 \text{ and } \lim_{x \rightarrow 3^+} f(x) = -\infty, \lim_{x \rightarrow 3^-} f(x) = -\infty$$

5. Find all relative extrema for  $f(x) = 2x + x^{\frac{2}{3}}$  (4 marks)