

No notes or calculators. Show all work.

1. (5 points) Find the second derivative of the following function:

$$f(x) = 3xe^{4x}$$

→ use product rule

$$f'(x) = 3e^{4x} + 12xe^{4x}$$

$$f''(x) = \frac{12e^{4x} + 12e^{4x} + 48xe^{4x}}{=} \leftarrow \text{acceptable answer}$$
$$= 24e^{4x} + 48xe^{4x}$$

2. (5 points) Determine the intervals on which the function is concave up or concave down.

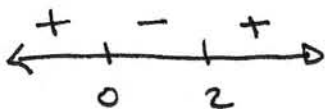
$$f(x) = 5x^4 - 20x^3 + 10$$

$$f'(x) = 20x^3 - 60x^2$$

$$f''(x) = 60x^2 - 120x$$

$$60x(x-2) = 0$$

$x=0, x=2$ possible inflection points



Test points using $f'' = 60x(x-2)$

$$x = -1 \quad f''(-1) = (-)(-) \rightarrow +$$

$$x = 1 \quad f''(1) = (+)(-) \rightarrow -$$

$$x = 3 \quad f''(3) = (+)(+) \rightarrow +$$

Concave up $(-\infty, 0) \cup (2, \infty)$
Concave down $(0, 2)$