Finding Increasing/Decreasing Intervals

p. 278 - 286 (4.3) # 44

To find the intervals where $f(x)$ is increasing or decreasing:
1) Find the critical #'s.
2) Set up test intervals on a # line.
3) Find the sign of $f'(x)$ for each interval.
4) If $f'(x) > 0$, then $f(x)$ is increasing (use arrow).
   If $f'(x) < 0$, then $f(x)$ is decreasing (use arrow).

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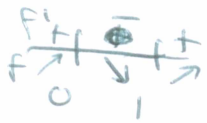
1. Find the intervals on which the function is increasing or decreasing for $f(x) = x^3 - \frac{3}{2}x^2$. Justify.

$f'(x) = 3x^2 - 3x = 0$

$3x(x-1) = 0$

$x = 0 \quad x = 1$



f is increasing on $(-\infty, 0)$ and $(1, \infty)$ since $f' > 0$ there.

f is dec. on $(0, 1)$ since $f' < 0$.

**2. The function f is given by $f(x) = x^4 + x^2 - 2$. On which intervals is f increasing?

$f'(x) = 4x^3 + 2x = 0$

$2x(2x^2 + 1) = 0$

$x = 0 \quad 2x^2 = -1$

f is increasing on $(0, \infty)$

**3. Where are all the values of x for which the function defined by $f(x) = (x^2 - 3)e^{-x}$ is increasing? $(-1, 3)$

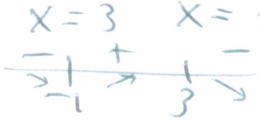
$f'(x) = (x^2-3)(-e^{-x}) + (e^{-x})(2x) = 0$

$-e^{-x}(x^2 - 3 - 2x) = 0$

$x^2 - 2x - 3 = 0$

$(x-3)(x+1) = 0$

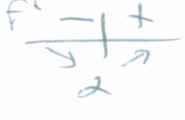
$x = 3 \quad x = -1$



4. Identify the intervals on which $f(x) = (x-2)^{2/3}$ is increasing or decreasing. Justify your answer.

$f'(x) = \frac{2}{3}(x-2)^{-1/3} = \frac{2}{3(x-2)^{1/3}}$

$x = 2$



f is increasing on $(2, \infty)$ since $f' > 0$ on $(2, \infty)$.
F is decreasing on $(-\infty, 2)$ since $f' < 0$ on $(-\infty, 2)$