Interpreting Graphs

Asymptotes

Vertical

$\lim_{x \to \#} f(x) = \pm\infty$

$\#$ ↓ denom = 0

Horizontal

$\lim_{x \to \infty} f(x) = \#$

$\lim_{x \to \infty} \frac{x^2}{x^3} = \lim_{x \to \infty} \frac{1}{x} = 0$

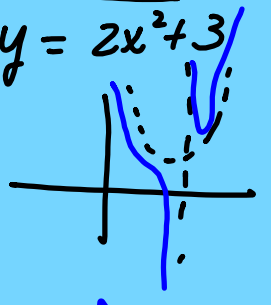
$\lim_{x \to \infty} \frac{x^4}{3x^3} = \lim_{x \to \infty} \frac{x}{3} = \infty$

numerator is one power higher

Slant: $y = mx^1 + b$

num. more than one power higher

Curvilinear: $y = 2x^2 + 3$



$f(x) \quad \frac{x^3 + 2x^2 - 4}{x^2 + 5}$

Find using long division.

$f(x) = \frac{4x^3 - 3x^2 - 5}{2x^2 + x + 3}$

$2x - 5/2$

$2x^2 + x + 3 \;\big|\; 4x^3 - 3x^2 + 0x - 5$

$-4x^3 + 2x^2 + 6x$

$-5x^2 - 6x - 5$

Slant $y = 2x - 5/2$

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$\lim_{x \to +\infty} f(x) = 3$ ← Horiz asymp

$\lim_{x \to -2^-} f(x) = -\infty$

$\lim_{x \to -2^+} f(x) = +\infty$

} Vert Asymp

$f(-5) = 1 \quad f(0) = -8 \quad f(2) = -1$

$f(3) = -3 \quad f(5) = 2 \quad f(7) = 6$

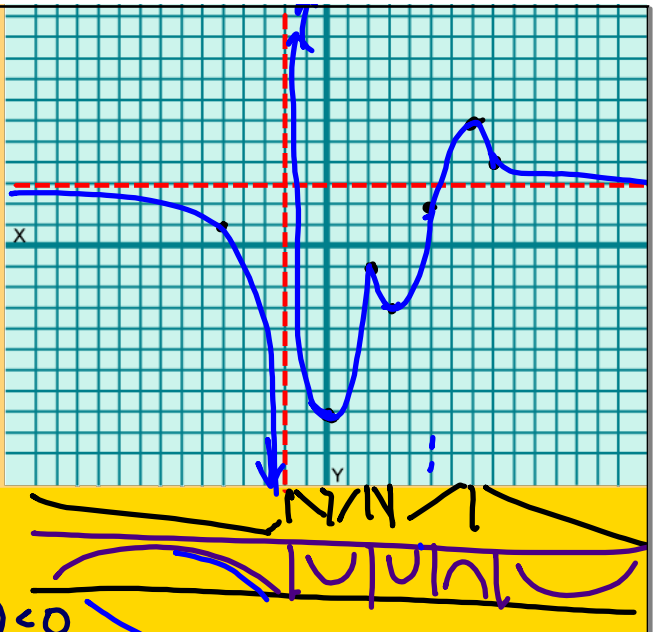
$f(8) = 4$

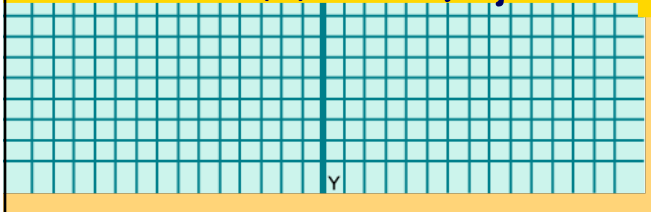
$(-\infty, -2)\ (-2, 0)\ (2, 3)\ (7, \infty)\ f'(x) < 0$ Dec

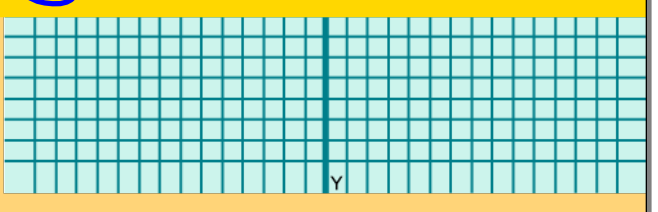
$(0, 2)\ (3, 7)\ f'(x) > 0$ Inc

$(-\infty, -2)\ (5, 8)\ f''(x) < 0$

$(-2, 2)\ (2, 5)\ (8, \infty)\ f''(x) > 0$







1) Find crit pts. (x-int of f') $f'(x) = 0$

← Where above/below x-axis

↑ Where f' is +/−

Crit pts: $-6, -1, 8$

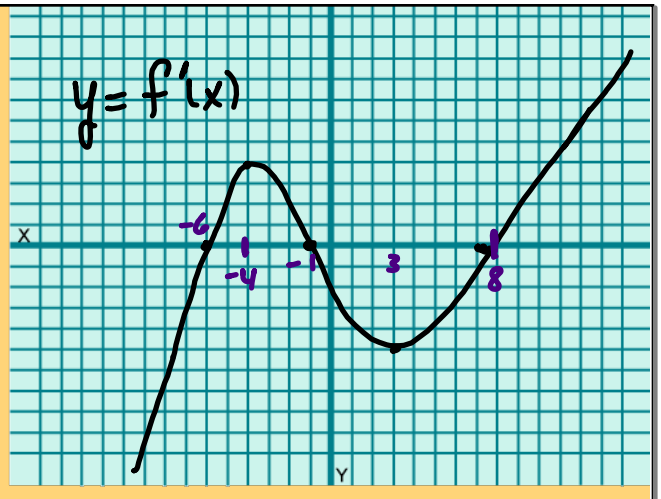
Increasing: $(-6,-1)(8,\infty)$

Decreasing $(-\infty,-6)(-1,8)$

Relative Extr. ← Do Mountain Test

Rel min: $-6, 8$

Rel max: -1

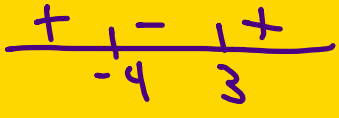


Concavity:

Infl pts on f are rel max/min on f'

Infl. pts: $-4, 3$

Concavity → Where f' is inc/dec



Concave up: $(-\infty,-4)$ $(3,\infty)$

Concave down: $(-4,3)$

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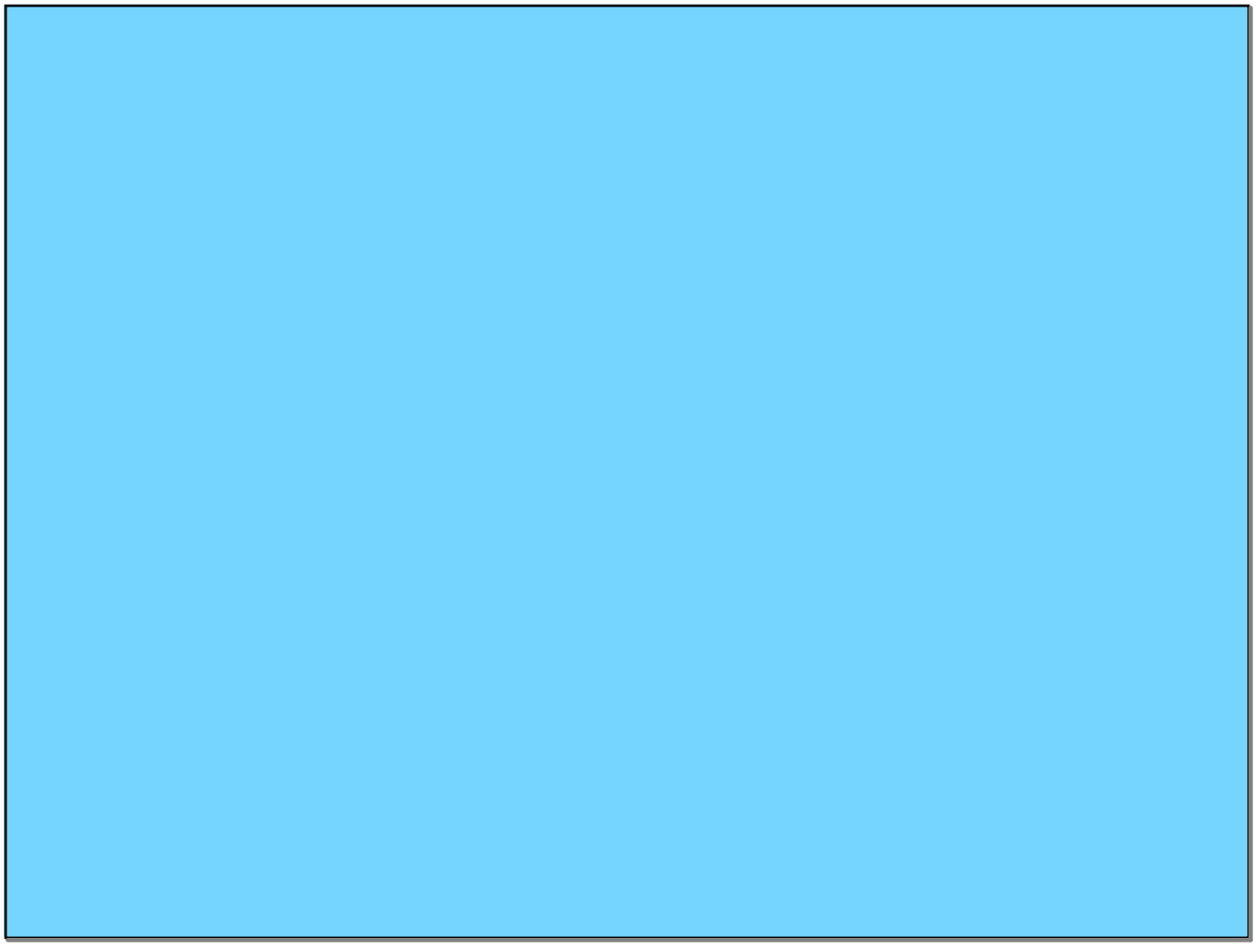

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