1. (a) $y' = 3x^2 e^{5x^2} + x^3 * 10x e^{5x^2}$

   (b) $y' = \dfrac{7}{7x+1} * \sqrt{x^3+7} + \ln(7x+1) * \dfrac{1}{2}\left(x^3+7\right)^{-1/2} * 3x^2$

   (c) $y' = 6(x^4+5)^5 * 4x^3 * \cos(3x^2) + (x^4+5)^6 * (-6x\sin(3x^2))$

2. (a) $y' = \dfrac{(x^8+7x)*(5x^4+2) - (x^5+2x)*(8x^7+7)}{(x^8+7x)^2}$

   (b) $y' = \dfrac{\sin(5x)*6xe^{3x^2} - e^{3x^2}*5\cos(5x)}{(\sin(5x))^2}$

   (c) Method 1: simplify with the logarithm rules.

   $y = \ln(\sin(x^5)) - 3\ln(7x^3-8)$

   $y' = \dfrac{5x^4\cos(x^5)}{\sin(x^5)} - 3 * \dfrac{21x^2}{7x^3-8}$

   Method 2: not fun method.

   $y' = \dfrac{\frac{(7x^3-8)^3 * 5x^4\cos(x^5) - \sin(x^5)*3(7x^3-8)^2*21x^2}{[(7x^3-8)^3]^2}}{\frac{\sin(x^5)}{(7x^3-8)^3}}$

3. (a)

critical values	b	c	d
classification	local min	local max	local min

   (b)

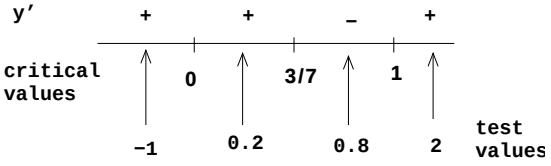
critical values	a	c	e
classification	local max	neither	local min

4. $y' = 3x^2(1-x)^4 + x^3 * 4(1-x)^3 * (-1)$

   $y' = x^2(1-x)^3[3(1-x) - 4x]$

   $y' = x^2(1-x)^3(3-7x)$

   critical values: $x = 0$, $x = 1$, $x = \frac{3}{7}$



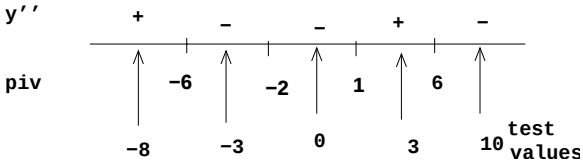
critical values	0	3/7	1
classification	neither	Local max	local min

5. (a) $f(x) = x^2 + \dfrac{5}{x} = x^2 + 5x^{-1}$

Note: domain is all real numbers except $x = 0$.

$f'(x) = 2x - 5x^{-2}$
$f''(x) = 2 + 10x^{-3} = 2 + \dfrac{10}{x^3}$
$0 = 2 + \frac{10}{x^3}$
$-2 = \frac{10}{x^3}$
$-2x^3 = 10$
$x^3 = -5$

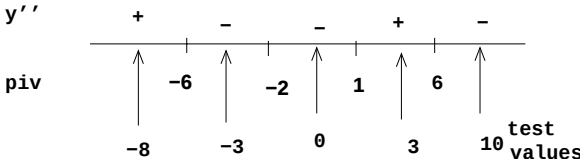
Piv = $x = -1.70997$ or -1.7100



Concave up: $(-\infty, -1.7100)$, $(0, \infty)$
Concave down: $(-1.7100, 0)$

Inflection point at $x = -1.7100$

(b) pivs: $x = 6$, $x = -6$, $x = -2$, $x = 1$



Concave up: $(-\infty, -6)$, $(1, 6)$
Concave down: $(-6, -2)$, $(-2, 1)$, $(6, \infty)$

inflection points at $x = -6$, $x = 1$, $x = 6$

6. $f'(x) = a - \frac{b}{x}$. since $x = 2$ is a critical value $f'(2) = 0$.
$0 = a - \frac{b}{2}$
$\frac{b}{2} = a$
this gives the formula: $f(x) = \frac{b}{2} * x - b\ln(x)$

the point being $(2, 5)$ says that $f(2) = 5$.

$5 = \frac{b}{2} * 2 - b\ln(2)$
$5 = b - b\ln(2)$
$5 = (1 - \ln(2))b$

$b = \frac{5}{1-\ln(2)} = 16.2945$

$a = 8.1473$