MATH 111–05 (Kunkle), Quiz 3 — Name: ______________________

10 pts, 10 minutes — Jan. 30, 2018

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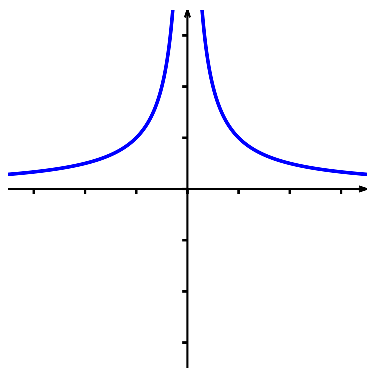
1 (10 pts). Sketch the graphs of the following functions. Include all asymptotes and their equations. Find all intercepts. Label your answers so I can tell your x-intercepts from your y-intercepts.

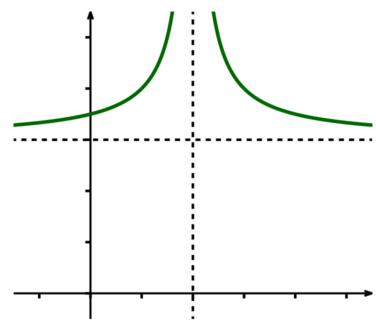
a. $f(x) = x^{-2/5}$ b. $g(x) = 3 + (x-2)^{-2/5}$.

(Source: 2.2.more.1f)

1a. In the first quadrant, the graph of $y = x^{-2/5} = \frac{1}{(\sqrt[5]{x})^2}$ looks roughly like $y = x^{-1}$. The axes $y = 0$ and $x = 0$ are asymptotes because $|y|$ is huge when $|x|$ is tiny and tiny when $|x|$ is huge. $\sqrt[5]{x}$ is defined for negative x-values, and when we compute its square and take reciprocals, the result is positive, so the graph of $y = x^{-2/5}$ looks the graph on the left:



a. $y = x^{-2/5}$



b. $y = 3 + (x-2)^{-2/5}$

1b. To obtain the graph of $y = 3 + (x-2)^{-2/5}$, shift the graph up 3 and to the right 2. This makes the two new asymptotes $y = 3$ and $x = 2$. See the graph on the right.

As our drawing suggests, the graph has no x-intercept. This because when we set $y = 0$ and solve for x, we come to the equation

$$-3 = (x-2)^{-2/5} = \left(\frac{1}{\sqrt[5]{x-2}}\right)^2.$$

Since the right side is a square, this has no real solutions.

At $x = 0$, we calculate the y-intercept to be $y = 3 + (0-2)^{-2/5}$. Since $(-1)^{-2/5} = 1$, the y-intercept can be more simply written as either $3 + 2^{-2/5}$ or $3 + \frac{1}{\sqrt[5]{4}}$.