Math 120 Exam #2 Key (Spring 2023)

1 $f(-3) = 26, \quad f(-x) = x^2 + 3x + 8, \quad f(x-1) = x^2 - 5x + 12.$

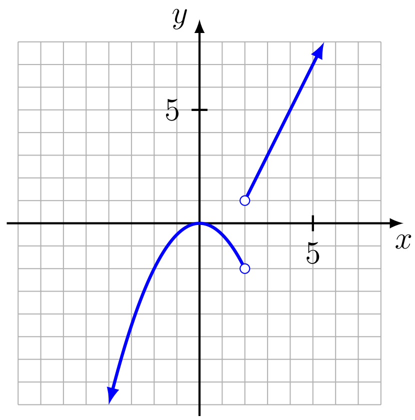
2a $g(-3)$ is undefined, $g(1) = 0$, $g(4) = 4$.

2b $D_g = (-3, 4], \quad R_g = [0, 4].$

3a Symmetric about origin only.

3b Neither.

4a



4b The graph may help: $D_q = (-\infty, 2) \cup (2, \infty)$, $R_q = (-\infty, 0] \cup (1, \infty)$.

5 Slope is $-\frac{5}{6}$, so $y - (-2) = -\frac{5}{6}(x - (-3))$ is the equation, which becomes $y = -\frac{5}{6}x - \frac{9}{2}$.

6 Equation is $y - (-6) = -\frac{3}{2}(x - 2)$, which in slope-intercept form is $y = -\frac{3}{2}x - 3$. The y-intercept is -3.

7 $y - 2x + 5 = 0$ becomes $y = 2x - 5$, so the given line has slope 2, and hence L has slope $-\frac{1}{2}$. Equation for L is thus $y = -\frac{1}{2}x - 3$.

8a $D_f = (-\infty, -7) \cup (-7, 7) \cup (7, \infty)$.

8b $D_r = \{x \mid x \neq 0 \text{ and } 12/x \neq -10\} = (-\infty, -\frac{6}{5}) \cup (-\frac{6}{5}, 0) \cup (0, \infty)$.

9a $D_F = [-8, \infty)$, $D_G = (-\infty, 12]$.

9b $(F-G)(x)=\sqrt{x+8}-\sqrt{12-x}$ with $D_{F-G}=D_F\cap D_G=[-8,12]$.

9c $(F/G)(x)=\dfrac{\sqrt{x+8}}{\sqrt{12-x}}$ with $D_{F/G}=[-8,12)$.

10a $(f\circ g)(x)=f(g(x))=\sqrt{\dfrac{5}{x-4}}$.

10b $D_f=[0,\infty)$ and $D_g=\{x\,|\,x\neq 4\}$, so

$$\begin{aligned} D_{f\circ g} &= \{x\,|\,x\in D_g \text{ and } g(x)\in D_f\} \\ &= \{x\,|\,x\neq 4 \text{ and } \tfrac{5}{x-4}\geq 0\} \\ &= \{x\,|\,x>4\}=(4,\infty). \end{aligned}$$

11a Set $y=f(x)$, and solve for x:

$$y=\frac{6x+5}{1-2x} \quad\hookrightarrow\quad y-2xy=6x+5 \quad\hookrightarrow\quad x=\frac{y-5}{2y+6} \quad\hookrightarrow\quad f^{-1}(y)=\frac{y-5}{2y+6}.$$

11b $R_{f^{-1}}=D_f=(-\infty,\frac{1}{2})\cup(\frac{1}{2},\infty)$ and $R_f=D_{f^{-1}}=(-\infty,-3)\cup(-3,\infty)$.