Name: _____

Place your answers in the spaces provided. <u>You must show correct work to receive credit</u>.
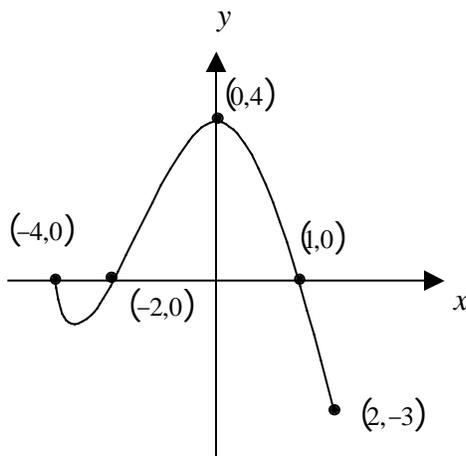
(14 pts) 1. Given the functions $f(x) = 2x^3$ and $g(x) = 5x - 3$, find and simplify each of the
following:

(4 pts) (a) $(f - g)(-1)$

(4 pts) (b) $\dfrac{f}{g}(3)$

(6 pts) (c) $(g \circ f)(x)$

(8 pts) 2. Given the graph of a function $y = f(x)$ below, find each of the following. Express your
answers in interval notation.

y

$(0,4)$

$(-4,0)$

$(1,0)$

$(-2,0)$ x

$(2,-3)$

(2 pts) (a) the domain

(2 pts) (b) the range

(4 pts) (c) all x such that $f(x) < 0$

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Place your answers in the spaces provided. <u>You must show correct work to receive credit</u>.

(12 pts) 3. Solve the following system of equations. Express your answer(s) as an ordered pair(s).

$$2x^2 - 3y = 23$$
$$y - 2x = -5$$

<div style="border:1px solid black; width:300px; height:70px;"></div>

(8 pts) 4. Given the function $g(x) = \dfrac{2}{x} - 5$, find the inverse function $g^{-1}(x)$.

$g^{-1}(x) =$ <div style="border:1px solid black; width:280px; height:60px; display:inline-block;"></div>

(8 pts) 5. If $f(x) = 2x^2 + kx - 5k$, find a number k such that the graph of f contains the point $(-3,4)$.

$k =$ <div style="border:1px solid black; width:200px; height:60px; display:inline-block;"></div>
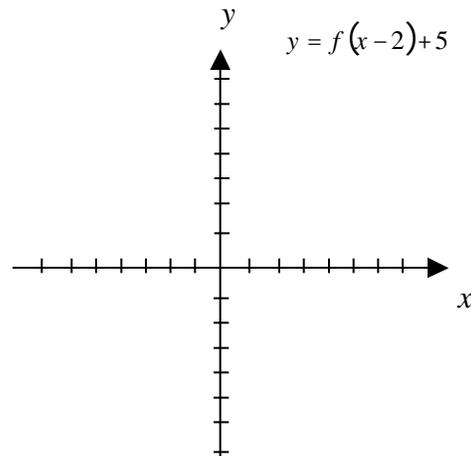
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(8 pts) 6. Find the <u>minimum value</u> of $f(x) = 3x^2 + 12x - 1$.

(10 pts) 7. Given the graph of $y = f(x)$ below with domain $[0,4]$, use the set of axes to sketch the graph of $y = f(x-2) + 5$. <u>Label the three main points on your sketch of the graph.</u>

(10 pts) 8. Given $f(x) = x^2 - x$, find and simplify $\dfrac{f(a+h) - f(a)}{h}$ $(h \neq 0)$.
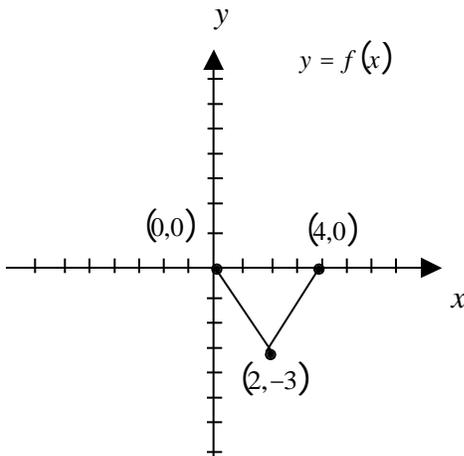
$$\frac{f(a+h) - f(a)}{h} = \boxed{}$$

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Place your answers in the spaces provided. <u>You must show correct work to receive credit.</u>

(12 pts) 9. A ball is thrown upward from ground level. The path of the ball is in the shape of a parabola. The ball was thrown a distance of 16 yards and the maximum height off the ground was 10 yards (see the figure below). Find the standard equation, $y = a(x - h)^2 + k$, for the path of the ball.

$$y = \boxed{}$$

(10 pts) 10. Suppose that the amount of spending money, M, Purdue students receive from their parents is directly proportional to the square root of the parents' annual income, I, and inversely proportional to the daily number of hours the student watches television, T.

(4 pts) (a) Express the statement in terms of $M, I, T,$ and a constant of proportionality, k.

$$\boxed{}$$

(6 pts) (b) If a student receives \$400, watches 5 daily hours of television, and his parent's annual income is \$62,500, find the value of k from part (a).

$$k = \boxed{}$$