FULL NAME _____
ID NUMBER _____

Read the directions. Clearly justify your answers.

1. (8 points) Consider the following rational function.

$$f(x) = \frac{x^2 - x - 2}{x^2 - 5x - 6}$$

(a) Find the zeros of the numerator.
Note $x^2 - x - 2 = 0 \iff (x-2)(x+1) = 0$. Thus the zeroes are 2 and -1.

(b) Find the zeros of the denominator.
Similarly, $x^2 - 5x - 6 = 0 \iff (x-6)(x+1) = 0$, so the zeroes are 6 and -1.

(c) Find the vertical asymptotes, if there are any.
There is a vertical asymptote at $x = 6$, since this is a zero of the denominator which is NOT shared by the numerator.

(d) Find the horizontal asymptote.
The horizontal asymptote is at $y = 1$, since $f(x) \sim \frac{x^2}{x^2}$ as x gets very large.

(e) Find the holes, if there are any.
There is a hole with x coordinate $x = -1$ since both the numerator and denominator have a zero at this coordinate. The y value of the hole is $y = \frac{x-2}{x-6}\Big|_{x=-1} = \frac{-3}{-7} = \frac{3}{7}$.

2. (2 points) Find the inverse of the given function (the function is one-to-one).

$$g(x) = 2x - 11$$

A. $g^{-1}(x) = 17$
B. $g^{-1}(x) = 11x - 2$
C. $g^{-1}(x) = \frac{x+11}{2}$
D. $g^{-1}(x) = \frac{2x+11}{5}$
E. $g^{-1}(x) = 0$

Total: _____/10

3. (0 points) What is the best frozen dessert?
   A. Ice cream
   B. Custard
   C. Frozen Yogurt
   D. Slushee
   E. Snow Cone
   F. Something else? _____

USEFUL FORMULAS

- $m = \dfrac{y_2 - y_1}{x_2 - x_1}$
- $y = mx + b$
- $Ax + By = C$
- $y - y_1 = m(x - x_1)$
- $a^2 - b^2 = (a + b)(a - b)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a - b)^2 = a^2 - 2ab + b^2$
- $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$
- $(x - h)^2 + (y - k)^2 = r^2$
- $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- $I = Prt$
- $A = P + Prt$
- $a^2 + b^2 = c^2$
- $\dfrac{f(x + h) - f(x)}{h}$
- $d = rt$
- $f(x) = a(x - h)^2 + k$
- $\left(-\dfrac{b}{2a}, f\left(-\dfrac{b}{2a}\right)\right)$
- $a^m a^n = a^{m+n}$
- $a^0 = 1$
- $\dfrac{a^m}{a^n} = a^{m-n}$
- $(a^m)^n = a^{m \cdot n}$
- $(ab)^m = a^m b^m$
- $\dfrac{1}{a^n} = a^{-n}$
- $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}, (b \neq 0)$
- $i = \sqrt{-1}$
- $i^2 = -1$