

Math 111
Final Exam Answers

1. Slope = $\frac{-2-(-7)}{-6-4} = \frac{5}{-10} = -\frac{1}{2}$

You can have any of the following answers:

$$\boxed{y + 7 = -\frac{1}{2}(x - 4), \quad \text{or} \quad y + 2 = -\frac{1}{2}(x + 6), \quad \text{or} \quad y = -\frac{1}{2}x - 5}$$

2. Squaring both sides: $6x - 9 = x^2 \Rightarrow 0 = x^2 - 6x + 9 \Rightarrow 0 = (x - 3)(x - 3)$

So, the solution is $\boxed{x = 3}$.

3. (a) $C(5) = \boxed{250} \Rightarrow$ It costs \$250,000 for the company to produce 5 items.

(b) Vertex Formula: $x = -\frac{-60}{2(2)} = 15$ Since $C(15) = 50$, the vertex is $\boxed{(15, 50)}$.

(c) Since the graph of $C(x)$ is a parabola that opens upward, and the vertex is $(15, 50)$, the range is $\boxed{C(x) \geq 50}$ or $\boxed{[50, \infty)}$.

(d)
$$\frac{C(x+h)-C(x)}{h} = \frac{2(x+h)^2-60(x+h)+500-(2x^2-60x+500)}{h}$$
$$= \frac{4xh+2h^2-60h}{h} = \boxed{4x + 2h - 60}$$

4. (a) $g^{-1}(2) = \boxed{0}$ since $g(0) = 2$.

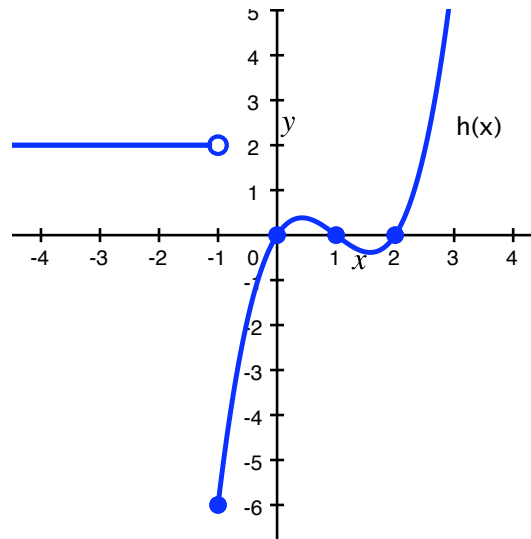
(b) $\frac{g(2)-g(-1)}{2-(-1)} = \frac{-1-3}{3} = \boxed{-\frac{4}{3}}$

(c) Since $f(1) = 2$, $g(f(1)) = g(2) = \boxed{3}$

(d) $\boxed{-7f(x - 3)}$

(e) $h(0) = 2f(0) - g(0) = 2(1) - 2 = \boxed{0}$

5. For $x < -1$, the function will be a horizontal line with y -values of 2.



For $x \geq -1$, we have the polynomial $y = x^3 - 3x^2 + 2x = x(x - 1)(x - 2)$, which has zeros at $x = 0$, $x = 1$, $x = 2$. It will have a shape like x^3 and goes through the point $(-1, -6)$, so it must look like the following.

6. The domain of $F(x)$ is $x \geq -2$ or $[-2, \infty)$. (We need $3x + 6 \geq 0$ for the fourth root to be defined.)

The domain of $G(x)$ is All real numbers or $(-\infty, \infty)$. (Exponential functions are defined for all real numbers.)

7. (a) Want to Find: x such that $(x, -2)$ is a point of $H(x)$

Need to solve: $\frac{2x^2 - 10}{x^2 + 3x} = -2 \Rightarrow 2x^2 - 10 = -2(x^2 + 3x)$

This is a quadratic equation that simplifies to $4x^2 + 6x - 10 = 0$

You can solve this by factoring or using the quadratic formula.

$$2(2x + 5)(x - 1) = 0 \Rightarrow x = -\frac{5}{2}, x = 1$$

- (b) x -intercepts: Solve $\frac{2x^2 - 10}{x^2 + 3x} = 0 \Rightarrow 2x^2 - 10 = 0 \Rightarrow x = \pm\sqrt{5}$

So, the x -intercepts are $(\sqrt{5}, 0), (-\sqrt{5}, 0)$.

y -intercepts: Evaluate $H(0)$: Since $\frac{2(0)^2 - 10}{(0)^2 + 3(0)}$ is undefined, there is no y -intercept.

- (c) Since the degree of the numerator and the denominator are equal, there is a horizontal asymptote and it is given by $y = 2$, which is the ratio of the leading coefficients.

Since the denominator factors into $x(x + 3)$, which is equal to zero when $x = 0$ and $x = -3$, there are vertical asymptotes at $x = 0$ and $x = -3$.

8. (a) Effective rate = $(1 + \frac{0.15}{12})^{12} - 1 \approx \boxed{0.16075 \text{ or } 16.075\%}$

(b) Using the compound interest formula, we need to solve: $5000 = 2000(1 + \frac{0.15}{12})^{12t}$

$$2.5 = (1.0125)^{12t}$$

$$\ln(2.5) = 12t \ln(1.0125)$$

$$t = \frac{\ln(2.5)}{12 \ln(1.0125)} \approx 6.1467 \text{ years}$$

9. You can afford a loan with a payment of $R = 350$ with $r = 0.03$, $k = 12$, $t = 5$. We are looking for the loan amount P that we can get with those payments.

Since $P = 350 \left[\frac{1 - (1 + \frac{0.03}{12})^{-12(5)}}{\frac{0.03}{12}} \right] = \$19,478.33$, we know that with a payment of \$350, you can get a \$19,478.33 loan. With a \$3000 down payment, that means you could buy a car for $\boxed{\$22,478.33}$.