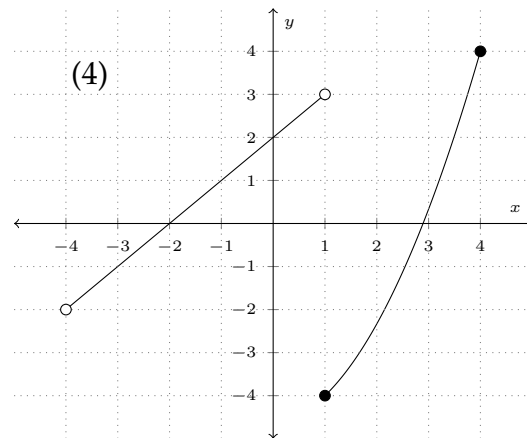
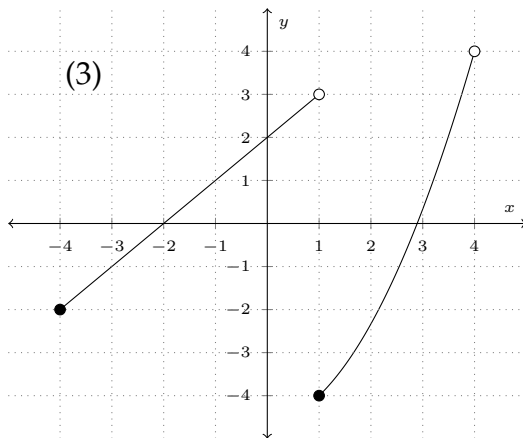
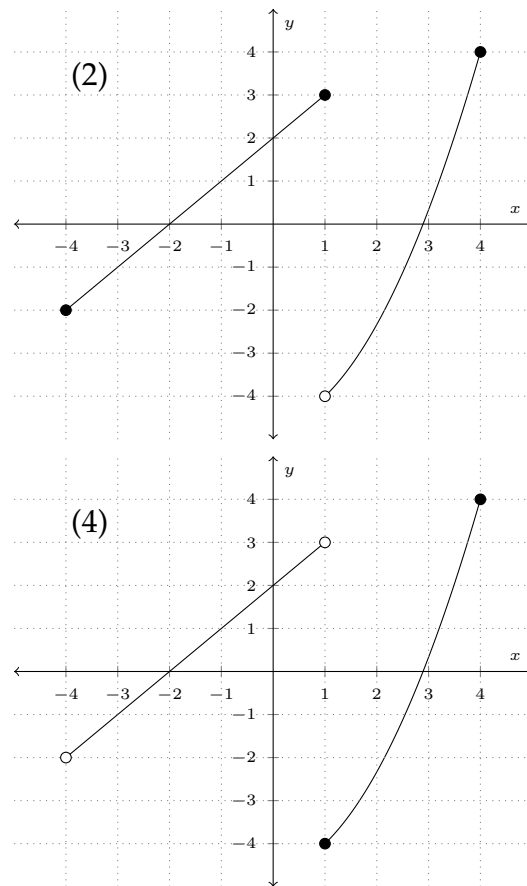
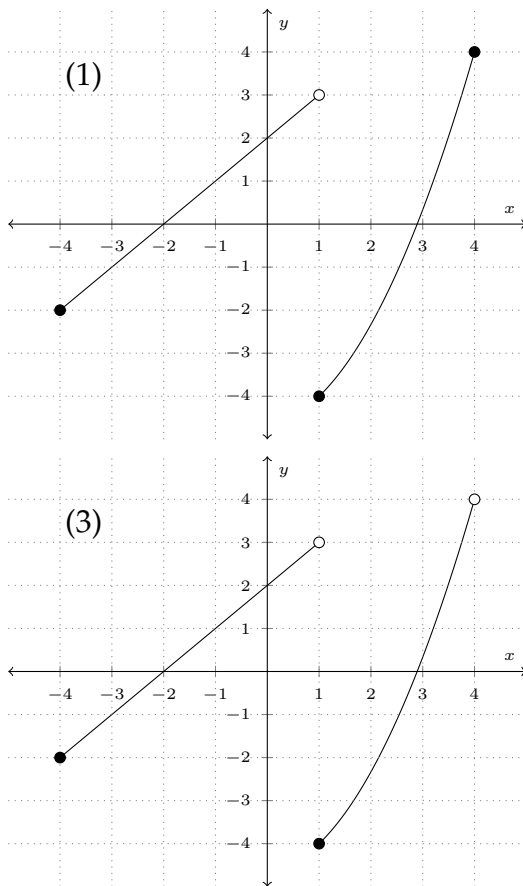


1. The graphs shown here (labeled (1)-(4)) satisfy certain characteristics. Match the description given in each part with one of the graphs shown here. Graphs may be used more than once.



(a) (6 points) This graph represents a function with domain $(-4, 4]$.

The answer to part (a) is

(b) (6 points) This graph represents a function with range $(-4, 4]$.

The answer to part (b) is

(c) (6 points) This graph represents the piecewise function

$$f(x) = \begin{cases} x + 2 & \text{if } -4 \leq x \leq 1 \\ \frac{1}{2}x^2 + \frac{1}{6}x - \frac{14}{3} & \text{if } 1 < x \leq 4 \end{cases}$$

The answer to part (c) is

2. Answer each of the following short answer questions. You do **not** need to show your work.

(a) (8 points) An investor will invest a total of \$25,000 into two accounts for one year. One account accumulates interest at 4% compounded annually and the other account accumulates interest at 5% compounded annually. She wants to earn \$1100 interest in total over the year. Let x be the amount that is invested in the 4% interest account and let y be the amount that is invested in the 5% interest account. Set up the system of two equations that can be solved for x and y . **DO NOT SOLVE THIS SYSTEM OF EQUATIONS.**

(b) (6 points) If $A = \begin{pmatrix} 2 & -4 & 3 & 1 \\ -4 & 1 & 2 & 0 \\ 4 & 3 & 5 & -1 \end{pmatrix}$ and B is a 4×2 matrix, then the product AB is a $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$ matrix.

(c) (6 points) The sequence below is arithmetic. Determine the missing term.

$$98, \underline{\hspace{1cm}}, 56, 35$$

(d) (6 points) Suppose f is a function with domain $(3, 10]$ and range $[-2, 4)$. In addition, f is one-to-one. What is the range of the inverse function of f ? Give your answer in interval notation.

Answer:

4. Answer each of the following short answer questions. You do **not** need to show your work.

(a) (8 points) Let

$$A = \begin{bmatrix} 0 & -8 \\ 3 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 1 & -1 \\ 2 & 5 \end{bmatrix}$$

Determine the product AB

$$AB = \begin{bmatrix} \underline{\hspace{2cm}} & \underline{\hspace{2cm}} \\ \underline{\hspace{2cm}} & \underline{\hspace{2cm}} \end{bmatrix}$$

(b) (6 points) Let

$$F(x) = \begin{cases} 2x - 3 & x < 1 \\ x^2 - 5 & x \geq 1 \end{cases}$$

i. Find $F(-2)$.

$$F(-2) = \boxed{\hspace{4cm}}$$

ii. Find $F(1)$.

$$F(1) = \boxed{\hspace{4cm}}$$

5. Answer the following interest theory questions.

- (a) (10 points) Suppose \$2500 is deposited into an account that gains interest at a rate of 4% compounded continuously. At time t (in years), the account has \$4000. Find t (in years), rounded to two decimal places (e.g. $t=12.34$ years). **Write the formula that you use to calculate t .**

$$t = \boxed{}$$

- (b) (10 points) You deposit \$400 into an investment fund that accumulates interest at an annual effective interest rate r . After 5 years, the fund has grown to \$575. Determine r as a percent rounded to two decimal places (e.g. 12.34%). **Write the formula that you use to calculate r .**

$$r = \boxed{}$$

- (c) (10 points) To purchase a new car, you borrow \$22,000 which will be repaid over the next 5 years with monthly payments of Y . The interest rate charged on the loan is 4.2% compounded monthly. Find Y , rounded to two decimal places. **Write the formula that you use to calculate Y .**

$$Y = \boxed{}$$

6. Solve the equations. Separate multiple solutions with a comma. Show all of your work. **Solutions by calculator will receive no credit.**

(a) (12 points)

$$\frac{-6}{x+1} + x = 4$$

$x =$

(b) (12 points)

$$\log_5(x-4) + \log_5(x+2) = \log_5(16)$$

$x =$

(c) (12 points)

$$\log_x(x^3 + 2x - 5) = 3$$

$x =$

7. (12 points) The **revenue** for selling q units of a product is given by $R = 20q$. The **cost** equation for producing q units is $C = 44 + 14q$. Determine q so that the profit is 10.

$q =$

8. (12 points) You are given the following supply and demand equations:

$$\begin{cases} S(q) = q + 3 \\ D(q) = \sqrt{29 - 2q} \end{cases}$$

Determine the equilibrium quantity, q . Show all of your work. **No credit will be given to calculator solutions.**

$q =$

9. (12 points) Let $f(x) = -2x^2 + 3$. Determine the expression for $\frac{f(x+h) - f(x)}{h}$. You must simplify your result.

$$\frac{f(x+h) - f(x)}{h} = \boxed{\phantom{\frac{f(x+h) - f(x)}{h}}}$$

10. (12 points) Use an augmented matrix, $[C|I]$, and elementary row operations to find the inverse of the following matrix:

$$C = \begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}$$

$$C^{-1} = \begin{bmatrix} & \\ & \end{bmatrix}$$

Scrap work

Some Useful Formulas

$$S = P(1 + r)^n$$

$$P = S(1 + r)^{-n}$$

$$r_e = \left(1 + \frac{r}{n}\right)^n - 1$$

$$S = Pe^{rt}$$

$$P = Se^{-rt}$$

$$r_e = e^r - 1$$

$$A = Ra_{\overline{n}|r} = R \frac{1 - (1 + r)^{-n}}{r}$$

$$R = \frac{A}{a_{\overline{n}|r}} = A \frac{r}{1 - (1 + r)^{-n}}$$

$$S = Rs_{\overline{n}|r} = R \frac{(1 + r)^n - 1}{r}$$

$$\sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1 - r}$$

$$\sum_{i=1}^k ar^{i-1} = \frac{a(1 - r^k)}{1 - r}$$

$$\text{Int}_k = R \cdot [1 - (1 + r)^{-n+k-1}]$$

$$\text{Prin}_k = R \cdot (1 + r)^{-n+k-1}$$