Question 1: This question consists of 20 short answer problems each worth 2%. For each problem, clearly write your answer in the box to the right AS ONLY THAT ANSWER WILL BE GRADED. The solution to each problem is short, requiring no more space than that given. Although no part marks are awarded, show your work clearly in case it is needed to support your final answer.

a)   Find the equation of the line that passes through the points (-1, 2) and (7, -2).

b)   Simplify $\dfrac{\left(x^2 y^3\right)^4}{\left(x^{-3} y^2\right)^{-3}}$.

c)   Future Shop had computers on sale at 40% off on Boxing Day so Eric purchased one that was on sale for $699.99. What was the original price? Ignore sales tax.

d)   Compute $\dfrac{\left(5.34 \times 10^{-5}\right)\left(1.46 \times 10^{5}\right)}{-1.02 \times 10^{-6}}$ and give your answer in scientific notation rounded to **3 decimal places**.

e)   Solve for x: $-2x^2 - 6x + 20 = 0$.

f)   Solve for x: $\left(\sqrt{2x-5}\right)^3 + 1 = 0$.

g)   Given $f(x) = \sqrt[3]{x+1}$, find and simplify $f(x^3 - 1)$.

h)   The slope of the line passing through $(-a, a)$ and $(2, 2a)$ is 2. Find the value of a.

i)   Find the slope of a line that is perpendicular to the line defined by the equation:

$x + y = 5x - y + 3$.

j)   What is the domain of the function $f(x) = \dfrac{x-2}{\sqrt{x-3}}$? Give your answer in interval notation.

k)   Find the simultaneous solution (point of intersection) of the lines $y = -3x + \dfrac{1}{2}$ and $y = x - \dfrac{5}{2}$.

l)   Represent $-\infty < x < 5$ using number line notation.

m) Find the inverse of $f(x) = \sqrt{x+1} - 2$.

n) Factor $x^2 + 6x + 8$.

o) Rationalize the bottom and simplify: $\dfrac{x^4 - 36}{x + \sqrt{6}}$.

p) If $f(x) = 3x + 5$ and $g(x) = \dfrac{1}{x-5}$, find and simplify $h(x) = (g \circ f)(x)$.

q)   Simplify $\dfrac{e^x + 1}{e^{2x} - 1}$.

r)   Evaluate $\log_7 \sqrt[3]{49}$.

s)   Solve for x: $\ln x^2 + \ln\left(\dfrac{1}{x}\right) = 1$.

t)   Solve for x: $3^{x+1} = 11$ (Give your answer to 4 decimal places).

Question 2:   **[10 points]**

Find all simultaneous solutions to the following system of equations (that is, find the points of intersection of the curves):

$$\begin{cases} x^2 - 2xy + y^2 = 1 \\ \quad\quad x + y = 1 \end{cases}$$

Clearly show all your steps.

Question 3:   **[10 points]**

A rectangle $8''$x$10''$ is to be reduced in size by cutting two strips of equal width, one from the length, the other from the width, so that the area is reduced by 32 sq in. How wide should the strips be?

Question 4:   **[10 points]**

Factor completely:

$$x^5 - x^4 - 6x^3 + 6x^2 + 8x - 8.$$

Question 5:   **[10 points]**

Solve $|2x - 3| \geq 7$ and write your solution using interval notation.

Question 6:   **[10 points]**

Sketch the graph of $y = \dfrac{-1}{x-2} - 1$. Before graphing, list the *basic graph* and each *transformation* you will use. **Label** the *intercepts* on the *x* and *y* axes.

Question 7:   **[10 points]**

a)   Sketch the graph of the **inverse** of $f(x) = 2^x + 1$. Label its intercept on the *x-axis*.

b)   Find $f^{-1}(x)$ (the inverse of f).