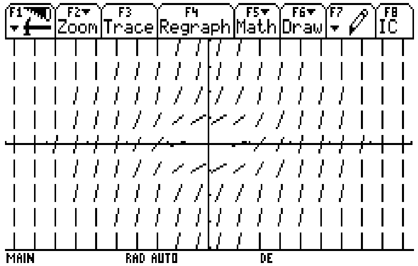
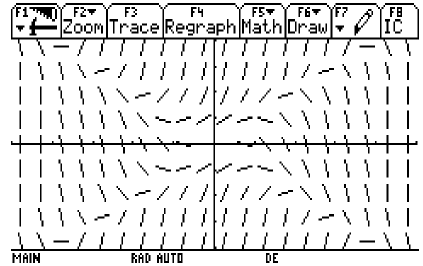
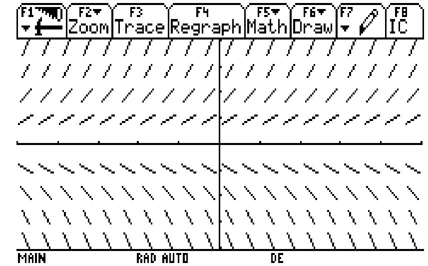
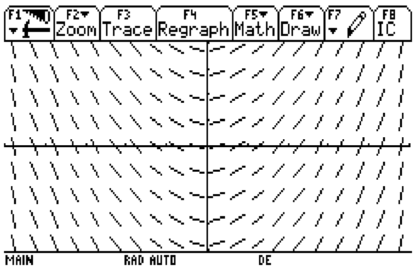
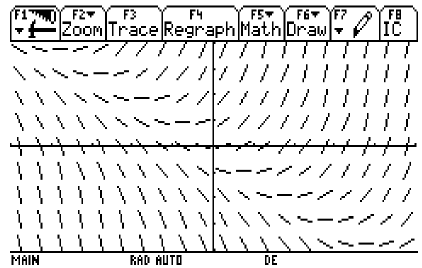
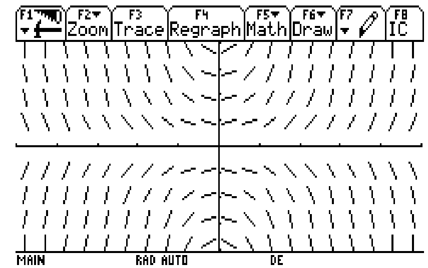


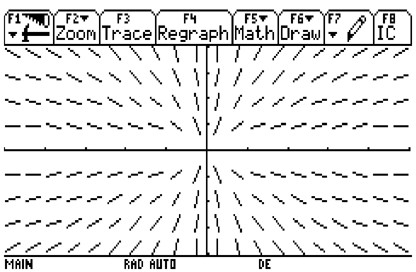


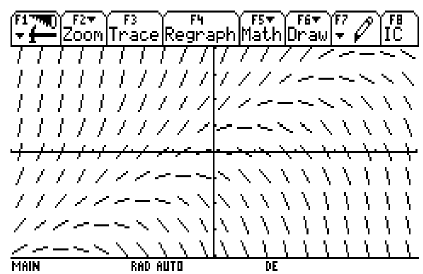












$$\frac{dy}{dx} = x^2 + y^2 \qquad \frac{dy}{dx} = y^2 - x^2$$

$$\frac{dy}{dx} = x + y \qquad \frac{dy}{dx} = y - x$$

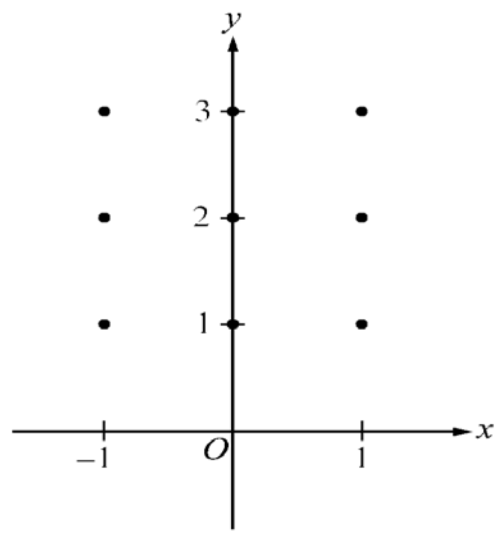
$$\frac{dy}{dx} = xy \qquad \frac{dy}{dx} = \frac{y}{x}$$

$$\frac{dy}{dx} = x \qquad \frac{dy}{dx} = y$$

1998 Calculus BC Free-Response Questions

4. Consider the differential equation given by $\dfrac{dy}{dx} = \dfrac{xy}{2}$.

   (a) On the axes provided below, sketch a slope field for the given differential equation at the nine points indicated.



A fresh cup of coffee is heated to 180 degrees Fahrenheit. The room temperature is 75 degrees. Write a differential equation that represents this situation.

Ten minutes later, it is 150 degrees.

Solve the differential equation and estimate when the temperature of the coffee will be 100 degrees.

In the middle of a snowstorm, a thermometer is taken outside from an office where the temperature is 68 degrees Farenheit. After one minute, it reads 55 and after 2 minutes, it reads 50.

What is the outside temperature?

$$\lim_{x\to 4}\left(\frac{x^2-16}{x^2+2x-24}\right) \qquad \lim_{x\to 0}\left(\frac{x^2-16}{x^2+2x-24}\right)$$

$$\lim_{x\to \infty}\left(\frac{x^2-16}{x^2+2x-24}\right) \qquad \lim_{x\to -6}\left(\frac{x^2-16}{x^2+2x-24}\right)$$

$$\lim_{x\to 4}\left(\frac{\sqrt{x}-2}{x-2}\right)$$

$$\lim_{x\to 0}\left(\frac{\tan(4x)}{3x}\right)$$

$$\lim_{x \to \infty} \left(\arctan(x) \right)$$

$$\lim_{n \to \infty} \left(\sqrt{n^2 + n} - \sqrt{n^2 + 10} \right)$$

$$\lim_{x \to \infty} \left(1 + \frac{1}{x} \right)^{x}$$

Note, there are many problems on related rates and optimization in the openers files.

Note : One fluid ounce occupies about 1.8046875 cubic inches

Find relative maximum and minimum values determine where the curve is concave up and concave down. For what values of t will the slope of the tangent to the curve be 1?

$$x = t\cos(t)$$

$$y = t\sin(t)$$

$$0 \le t \le 4\pi$$

$$\begin{cases} x(t) = \sec(t) \\ y(t) = \tan(t) \end{cases}$$

Determine all values of t where the graph will have a vertical tangent, horizontal tangent, or a tangent with a slope of 1

$$\lim_{x\to\infty}\left(1-\frac{7}{x}\right)^{2x}$$

$$f(x) = x^5 - 4x^3 + x^2 - 7$$

There is a zero of f(x) between 2 and 3. Use Newton’s method to approximate it to 5 decimal places.

Find a zero of f(x) using Newton’s method

$$f(x) = x^5 + x^3 + x^2 - 20$$

$$f(2) = 24$$

Use Newton's method to approximate $\sqrt[3]{9}$ correct to three decimal places

$$\begin{cases} x = 3\cos(2t) \\ y = 4\sin(2t) \end{cases}$$

Sketch

Write an equation of the line tangent to the function when $t = \frac{\pi}{12}$

Write a Fifth degree Taylor polynomial centered at zero for each of

$$f(x) = e^x$$

$$g(x) = \sin(x)$$

$$h(x) = \cos(x)$$

$$f(x) = \sqrt{x}$$

Write a linear, quadratic and cubic approximation to f near 9. Use these to approximate $\sqrt{8}$ Then use Newton's method to do the same thing.

$$f(x) = \begin{cases} ax^2 + 2 \text{ if } x \geq 1 \\ bx + 1 \text{ if } x < 1 \end{cases}$$

f is continuous and differentiable on $[0,2]$ Determine a and b. Then determine the value of c guaranteed by The Theorem of the Mean.

A population of honey bees grows logistically. It is known that a maximum of 1000 bees can survive in a given hive. Write a differential equation that represents this situation.

If fifty bees are introduced to this hive when it is new, and there are 100 bees after two days, find the function that will be used to determine the bee population at any time t.

Write a Taylor Polynomial approximation for $\ln(x+1)$

near 0. Include five non-zero terms and a general term. Graph both of them.

Write a Taylor Polynomial approximation for $\ln(x)$

near 1. Include five non-zero terms and a general term. Graph both of them.

A function *f* is continuous on $\left[2,8\right]$ and differentiable on $\left(2,8\right)$

$$f\left(2\right)=10 \text{ and } f\left(8\right)=3$$

Write as many true statements as you can about f.

Use the intermediate value theorem, the extreme value theorem and the mean value theorem.

$$f(0) = -8,\ f(2) = 4,\ f(6) = 28$$

F is continuous and twice differentiable on $[-1,10]$

Show that the second derivative of f is zero somewhere on the interval $(0,4)$

$$f(x) = (x)^{\frac{2}{3}}$$

Is f continuous on $[-1, 1]$

What is the value of the derivative of f guaranteed by the mean value theorem?

For what value of c does f take on that value?