

**CALCULUS II – Worksheet #38**

1995 Free Response (4)

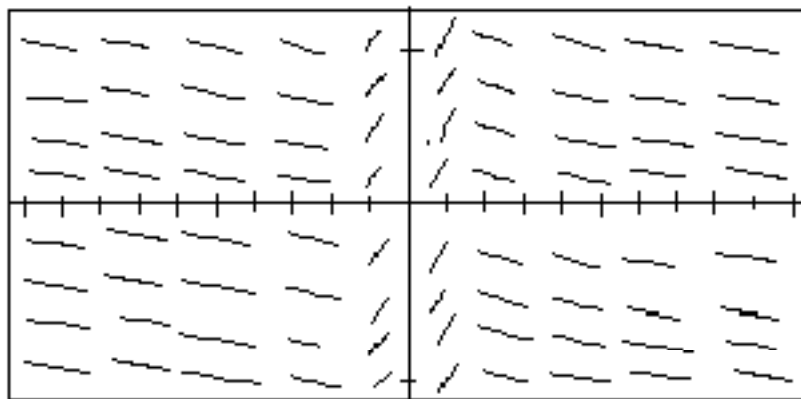
Let  $f$  be a function that has derivatives of all orders for all real numbers.

Assume  $f(1) = 3$ ,  $f'(1) = -2$ ,  $f''(1) = 2$ , and  $f'''(1) = 4$ .

- a) Write the second-degree Taylor polynomial for  $f$  about  $x = 1$  and use it to approximate  $f(0.7)$ .  $f(x) \approx 3 - 2(x - 1) + (x - 1)^2$        $f(0.7) \approx 3.69$
- b) Write the third-degree Taylor polynomial for  $f$  about  $x = 1$  and use it to approximate  $f(1.2)$ .  
 $f(x) \approx 3 - 2(x - 1) + (x - 1)^2 + \frac{4}{3!}(x - 1)^3$        $f(1.2) \approx 2.645$
- c) Write the second-degree Taylor polynomial for  $f'$ , the derivative of  $f$ , about  $x = 1$  and use it to approximate  $f'(1.2)$ .  $f'(x) \approx -2 + 2(x - 1) + 2(x - 1)^2$        $f'(1.2) \approx -1.52$

1. Which one of the following improper integrals converges?

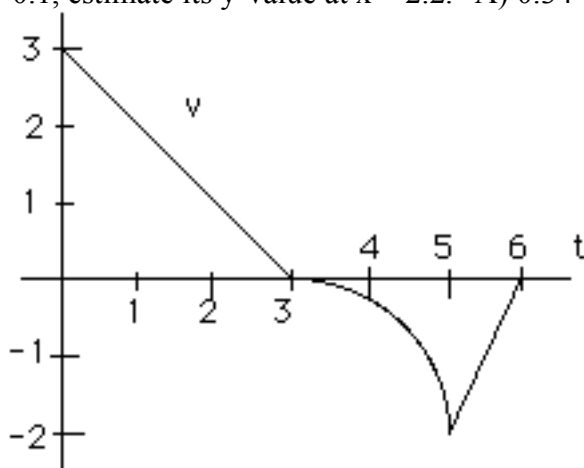
- A)  $\int_{-1}^1 \frac{dx}{(x+1)^2}$
- B)  $\int_1^{\infty} \frac{dx}{\sqrt{x}}$
- C)  $\int_0^{\infty} \frac{dx}{(x^2+1)}$
- D)  $\int_1^3 \frac{dx}{(2-x)^3}$
- E) none of these



2. Which function could be a particular solution of the differential equation whose slope field is shown above?

- A)  $y = x^3$
- B)  $y = \frac{2x}{x^2 + 1}$
- C)  $y = \frac{x^2}{x^2 + 1}$
- D)  $y = \sin x$
- E)  $y = e^{-x^2}$

3. A particular solution of the differential equation  $\frac{dy}{dx} = x + y$  passes through the point (2,1). Using Euler's method with  $\Delta x = 0.1$ , estimate its y-value at  $x = 2.2$ . A) 0.34 B) 1.30 C) 1.34 D) 1.60 E) 1.64



The graph shown above, consisting of two line segments and a quarter circle, is for Questions 4 and 5. It shows the velocity of an object during a 6-second interval.

- 4. For how many values of  $t$  is the acceleration undefined? A) none B) 1 C) 2 D) 3 E) 4
- 5. During what time interval is the speed increasing? (Note: speed inc when signs of  $v$  and  $a$  are the same)  
A)  $0 < t < 3$  B)  $3 < t < 5$  C)  $3 < t < 6$  D)  $5 < t < 6$  E) never