

MATH 1450 EXAM 3

NAME _____ GRADE _____ OUT OF 15 PTS

Answer each of following questions correctly for a full credit.

1. **(3pts) Optimization**

- (a) Find the point P on the line $x + y = 2$ that is closest to the point $A(-3, 1)$.
- (b) Find two positive numbers such that the sum of the first and twice the second is 320 and the product is a maximum.

2. Antiderivatives

A-(4pts) i) Evaluate $\int 3x^3 + 5 dx$

iii) Evaluate $\int \cos(x) dx$

ii) Evaluate $\int \frac{1+x}{x^2} dx$

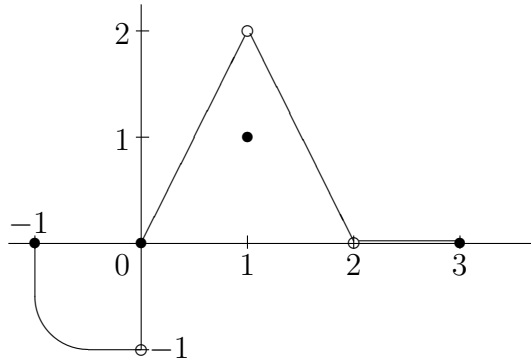
iv) Evaluate $\int \sec^2 t dt$.

B- (2pts) A car traveling with initial ($t = 0$) velocity 24 m/s begins to slow down at time $t = 0$ with a constant deceleration of $a = -6 \text{ m/s}^2$. Find:

(i) the velocity $v(t)$ at time t

(ii) the distance traveled before the car comes to a halt.

3. (1.5pt) Given graph of $f(x)$, answer the following question.



- a) Find $f(1)$
- b) What is $\lim_{x \rightarrow 1^-} f(x)$?
- c) What is $\lim_{x \rightarrow 1^+} f(x)$?
- d) What is $\lim_{x \rightarrow 1} f(x)$?
- e) Is f continuous at $x = 1$?, justify your response.

4. (1.5pt) Find c to make the following function g a continuous function.

$$g(x) = \begin{cases} x^2 - c^2 & \text{if } x < 4 \\ cx + 20 & \text{if } x \geq 4 \end{cases}$$

5. (3pts) Evaluate the following limits *analytically or computationally*. Justify your answer by showing your work (**No** decimal)!

(a) $\lim_{x \rightarrow \infty} \frac{2 + 3x - 4x^3}{x^3 + 1}$

(b) $\lim_{x \rightarrow \infty} 2x \tan\left(\frac{5}{x}\right)$

(c) $\lim_{x \rightarrow 1} \frac{x - 1}{x^2 - 1}$

(d) $\lim_{x \rightarrow 2} x^3 - 1$

(e) $\lim_{x \rightarrow 0^-} \left(7 + \frac{8}{x}\right)$

(f) $\lim_{x \rightarrow 5^+} \ln(x - 5)$