

FIN
CALC

Student Name

Student I.D.

Instructor:

Time: 3 hours

Instructions:

- Print your name
- All questions provided. Show your work.
- A Sharp EL-509B calculator is permitted.

This examination is a complete examination.

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1. (16 marks)

Evaluate the following

$$(a) \lim_{x \rightarrow 5} \frac{x^2 + 1}{x^2 - 1}$$

$$= \lim_{x \rightarrow 5}$$

$$(b) \lim_{x \rightarrow 3} \frac{\sqrt{3x} - 1}{3}$$

$$= \lim_{x \rightarrow 3}$$

$$= \lim_{x \rightarrow 3}$$

$$= \frac{-3}{\sqrt{3(3)} - 5}$$

1. (continued)

$$(c) \lim_{x \rightarrow 6^-} \frac{3x^2 - 18x}{|x - 6|}$$

If $x \rightarrow 6^-$, $x < 6$, so $x - 6 < 0$

$$\text{so } |x - 6| = -(x - 6)$$

$$\begin{aligned} \lim_{x \rightarrow 6^-} \frac{3x^2 - 18x}{|x - 6|} &= \lim_{x \rightarrow 6^-} \frac{3x \cancel{(x - 6)}}{-\cancel{(x - 6)}} = \lim_{x \rightarrow 6^-} (-3x) \\ &= -3(6) = \boxed{-18} \end{aligned}$$

$$(d) \lim_{x \rightarrow -\infty} \frac{2x^3 - x^2 + 8}{x(5 - x^2)} = \lim_{x \rightarrow -\infty} \frac{2x^3 - x^2 + 8}{5x - x^3} \cdot \frac{\left(\frac{1}{x^3}\right)}{\left(\frac{1}{x^3}\right)}$$

$$= \lim_{x \rightarrow -\infty} \frac{2 - \frac{1}{x} + \frac{8}{x^3}}{\frac{5}{x^2} - 1} = \frac{2 - 0 + 0}{0 - 1} = \boxed{-2}$$

2.

Find

(a)

f'

$=$

$=$

$=$

(b)

$f'(c)$

$=$

$=$

2. (c)

(c) $f(a)$

$f'(x)$

=

=

=

=

(d) $f(a)$

$f'(x)$

=

=

3. (4 r

Use only t

Importan

$$f'(x)$$

$$= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

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4. (8 marks)

(a) Find the

$$f'(x) =$$

The slope of

$$m_t = f'(x)$$

So, using the
tangent line



(b) Find the

point (2,

$$f'(x) = \frac{9}{2}$$

$$= \frac{9}{2}$$

at (2, 1)

so the slope

The equation

$$y - 1 = \frac{9}{2}x$$

c

f

7

7.

For t

(i)

(i)

(i)

(i)

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Use

Note

(i) f

f

(ii) Hon:

$$\lim_{x \rightarrow \infty} f(x)$$

$$\lim_{x \rightarrow -\infty} f(x)$$

So

Vert

$$\lim_{x \rightarrow 2^-} f(x)$$

$$\lim_{x \rightarrow 2^+} f(x)$$

So

10/1/14

8. (6 m

An electric

s) according

If the elect

the power

Hint: simpl

The power

$$P = i^2 R$$

$$P(t) =$$

$$P'(t) =$$

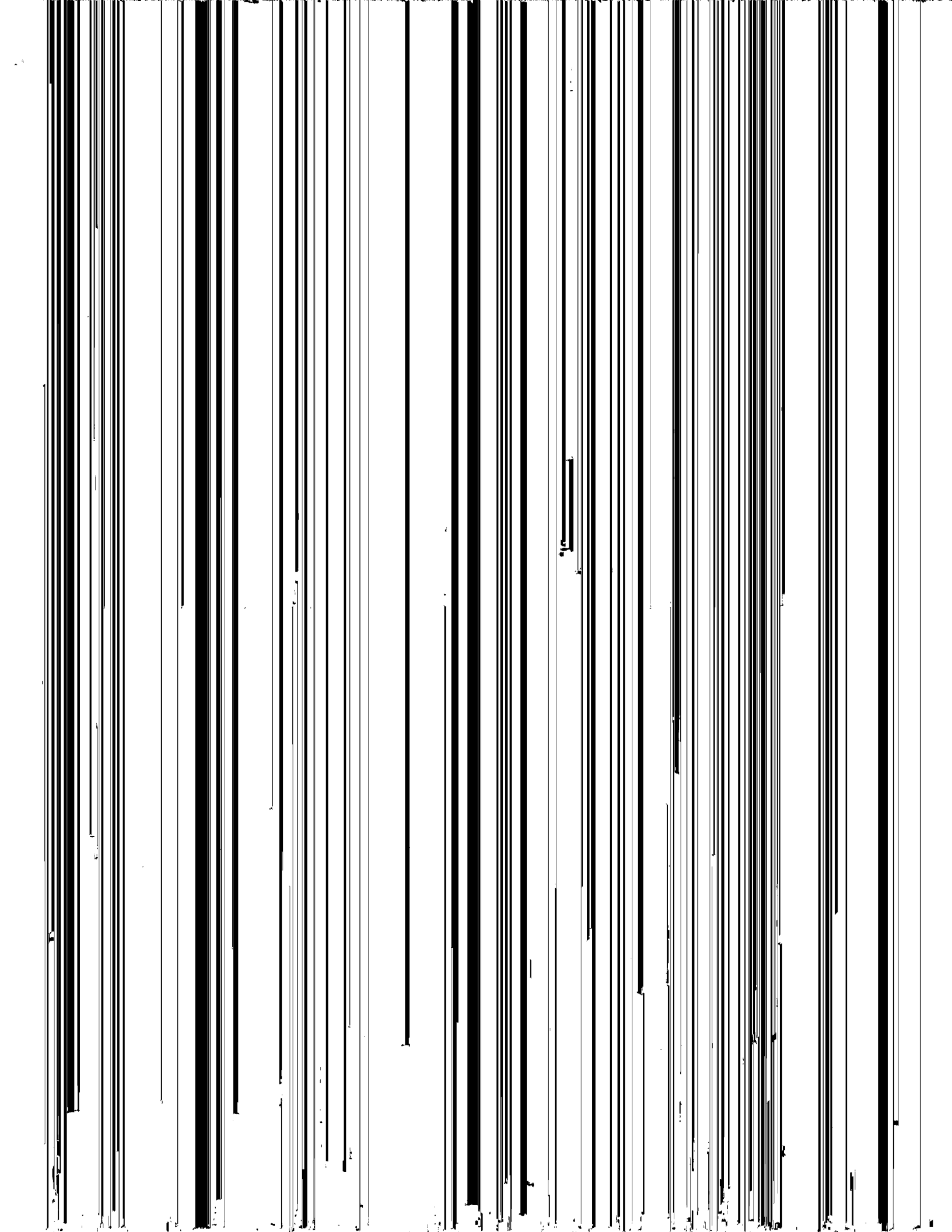
$$\text{so } P'(t)$$

If $0 < t < 2$,

If $t > 2$,

$$\text{so } P(t)$$

The power



10. (8 marks)

Evaluate the following de

$$(a) \int_1^3 \left(5 + \frac{2}{x} - \frac{1}{x^2} \right) dx$$

$$\int \left(5 + \frac{2}{x} - \frac{1}{x^2} \right) dx$$

$$= 5x + 2 \ln|x| + \frac{1}{x}$$

$$\text{So } \int_1^3 \left(5 + \frac{2}{x} - \frac{1}{x^2} \right) dx$$

$$= \left[5(3) + 2 \ln(3) + \frac{1}{3} \right] - \left[5(1) + 2 \ln(1) + 1 \right]$$

$$= 15 + 2 \ln 3 + \frac{1}{3} - 6 - 1$$

$$(b) \int_0^1 (2x^3+1) \sqrt{x^4+2x+1} dx$$

$$\text{Let } u = x^4 + 2x + 1$$

$$\int (2x^3+1) \sqrt{x^4+2x+1} dx$$

$$= \frac{1}{2} \frac{u^{3/2}}{\left(\frac{3}{2}\right)} = \frac{1}{3} u^{3/2}$$

$$\text{So } \int_0^1 (2x^3+1) \sqrt{x^4+2x+1} dx$$

$$= \frac{1}{3} (1+2+1)^{3/2} - \frac{1}{3} (0+0+1)^{3/2}$$

$$= \frac{1}{3} (8) - \frac{1}{3}$$

11. (6 marks)

A $120\text{-}\mu\text{F}$ capacitor initially at $t=0$, a current $i(t) = 6e^{-500t}$ flows through the circuit containing the capacitor to reach 150V .

$$V_c = \frac{1}{C} \int i dt$$
$$= 500 \int t$$

At $t=0$, $V_0 = 0$

$$V_c =$$

We must find

$$150 =$$
$$250$$

The voltage across the capacitor

in 0.45 seconds