MATH 113 – QUIZ 10 – 21 NOVEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. Consider the function $f(x) = 2x^3 + 4x^2 - \sin(\pi x)$.

(a) (3 pts.) Find the linearization of $f(x)$ at $a = -1$.

$f(-1) = 2(-1)^3 + 4(-1)^2 - \sin(-\pi) = 2$

$f'(x) = 6x^2 + 8x - \pi\cos(\pi x)$

$f'(-1) = 6(-1)^2 + 8(-1) - \pi(\cos(-\pi)) = \pi - 2$

$L(x) = f(-1) + f'(-1)(x+1) = 2 + (\pi-2)(x+1)$ //

(b) (2 pts.) Use the linearization to estimate $f(-1.2)$. You may leave your answer in terms of π.

$f(-1.2) \approx L(-1.2) = 2 + (\pi - 2)(-.2) = 2.4 - .2\pi$ //

(Actual value ≈ 1.71621, about 3% error) (≈ 1.77168)

2. (5 pts.) Find a point c in $(2, 4)$ that satisfies the Mean Value Theorem, that is, such that

$$\frac{f(4) - f(2)}{4 - 2} = f'(c)$$

where $f(x) = 2x^2 + 4x$.

$f'(c) = 4c + 4$ $\quad \frac{f(4) - f(2)}{4-2} = \frac{48-16}{2} = 16$

$4c + 4 = 16 \longrightarrow c = 3$ //

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Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. Consider the function $f(x) = 4x^3 - 2x^2 - \ln(x)$.

(a) (3 pts.) Find the linearization of $f(x)$ at $a = 1$.

$f(1) = 4 - 2 - \ln(1) = 2$

$f'(x) = 12x^2 - 4x - \frac{1}{x}$

$f'(1) = 12 - 4 - 1 = 7$

$L(x) = f(1) + f'(1)(x-1) = 2 + 7(x-1)$ //

(b) (2 pts.) Use the linearization to estimate $f(1.2)$.

$f(1.2) \approx L(1.2) = 2 + 7(.2) = 3.4$ //

(Actual value ≈ 3.8497, about 12% error)

2. (5 pts.) Find a point c in $(0, 2)$ that satisfies the Mean Value Theorem, that is, such that

$$\frac{f(2) - f(0)}{2 - 0} = f'(c)$$

where $f(x) = 2x^2 - 4x$.

$f'(c) = 4c - 4$ $\qquad \frac{f(2) - f(0)}{2 - 0} = \frac{(8-8) - (0-0)}{2} = 0$

$4c - 4 = 0 \qquad c = 1$ //

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Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. Consider the function $f(x) = 2x^3 - 4x - e^{1-x}$.

(a) (3 pts.) Find the linearization of $f(x)$ at $a = 1$.

$f(1) = 2 - 4 - e^0 = -3$

$f'(x) = 6x^2 - 4 + e^{1-x}$

$f'(1) = 6 - 4 + e^0 = 2$

$L(x) = f(1) + f'(1)(x-1) = -3 + 2(x-1)$ //

(b) (2 pts.) Use the linearization to estimate $f(1.2)$.

$f(1.2) \approx L(1.2) = -3 + 2(.2) = -2.6$ //

(Actual value ≈ -2.565403, about 1.3% error)

2. (5 pts.) Find a point c in $(1, 3)$ that satisfies the Mean Value Theorem, that is, such that

$$\frac{f(3) - f(1)}{3 - 1} = f'(c)$$

where $f(x) = x^2 - 4x + 3$.

$f'(c) = 2c - 4$

$$\frac{f(3) - f(1)}{3 - 1} = \frac{(9 - 12 + 3) - (1 - 4 + 3)}{2}$$

$= 0$

$2c - 4 = 0 \longrightarrow c = 2$ //