Delft University of Technology

Calculus (CSE1200 / TI1106M)

Test 1, 27-11-2018, 18:30 – 19:30

Remarks:

No calculators allowed, only answers will be graded, grade $= 1 + \frac{1}{2}$Score.

2pt   1. Find the derivative of $\arctan(\frac{1}{x})$.

2pt   2. Consider the function $f : [0, a] \to \mathbb{R}$
given by $f(x) = 5x - x^2$.
Find the largest positive a such that
f is invertible on $[0, a]$.

$a =$

3. Simplify the expressions.
(i.e., write without (inverse) trigonometric functions.)

1pt   a. $\arcsin(\sin(\frac{3}{4}\pi))$

1pt   b. $\cos(\arctan(\frac{1}{3}))$

2pt   4. Consider the relation $xy^2 = y^3 + 12$.
Find $\frac{dy}{dx}$ at the point $(x, y) = (5, 2)$.

$\frac{dy}{dx} =$

2pt 5. Find, if possible, $\lim_{x \to 0^+} \arctan(\ln(x))$.
Note: Also $\pm\infty$ and "Does not exist"
are possible answers!

6. Find all horizontal and vertical asymptotes
of the function defined by $f(x) = \dfrac{2 - \sqrt{4 + x^2}}{3x}$.

1pt   a. Horizontal asymptote(s):
Note: Also "None" is a possible answer!

1pt   b. Vertical asymptote(s):
Note: Also "None" is a possible answer!

2pt 7. Find, if possible, $\lim_{x \to 0} \dfrac{\ln(1 + x^2)}{1 - \cos(3x)}$.
Note: Also $\pm\infty$ and "Does not exist"
are possible answers!

2pt 8. Consider the function f given by $f(x) = x^3$.
Find the linearization of f at -2.

$L(x) =$

2pt 9. A square has edge size r and area A.
Suppose A changes from 81 to 80.
Use differentials to estimate
the corresponding change in r.
(You can leave your answer as a fraction.)