Math 100. Quiz 3. 2017-10-19 (Thursday) **Time 25min**

Section ....   Instructor name ....

Your email ....

- **For each computation of limits in this test, if the limit does not exist, indicate whether it diverges to $-\infty$ or $+\infty$.**

- Simplify all your answers as much as possible and express answers in terms of fractions or constants such as $\frac{1}{100}$, $\sqrt{e}$ or $\ln(4)$ rather than decimals.

1. Each part of this question is worth 1 mark, and the correct answer will get the full mark.

   (a) Suppose $f(x)$ and $g(x)$ are differentiable functions such that $f(1) = 3$, $f'(1) = -1$, $g(1) = 1$ and $g'(1) = -2$. If $h(x)$ is defined by

   $$h(x) = \sqrt{f(x) + g(x)}$$

   compute $h'(1)$.

   (b) Find all values α such that $f'(0) = 2$ where $f(x) = \arccos(\alpha x)$.

2. Each part of this question is worth 2 marks. **You have to show all your work in order to get credit.**

(a) **(2pt)** Let $f(x)$ be a differentiable function such that $f(1) = -3$ and $f'(1) = 5$. Evaluate the limit by identifying it as a derivative

$$\lim_{x \to 1} \frac{x(f(x))^2 - 9}{x - 1}$$

(b) **(2pt)** Given the equation

$$\cos(xy) + \arctan(y) = 2y + x$$

compute $\dfrac{dy}{dx}$ at the point $(x, y) = (1, 0)$.

3. This question is worth 4 marks. **You have to show all your work in order to get credit.**

Find the equation of the tangent line to the graph

$$y = \frac{1}{2}x^{x^2}(1 + x^2)^x$$

at the point $(x, y) = (1, 1)$.

Math 100. Quiz 3. 2017-10-19 (Thursday Q3-T-n) **Time 25min**

Section ....   Instructor name ....

Your email ....

- **For each computation of limits in this test, if the limit does not exist, indicate whether it diverges to $-\infty$ or $+\infty$.**

- Simplify all your answers as much as possible and express answers in terms of fractions or constants such as $\frac{1}{100}$, $\sqrt{e}$ or $\ln(4)$ rather than decimals.

1. Each part of this question is worth 1 mark, and the correct answer will get the full mark.

   (a) Suppose $f(x)$ and $g(x)$ are differentiable functions such that $f(1) = 3$, $f'(1) = -1$, $g(1) = 1$ and $g'(1) = -2$. If $h(x)$ is defined by

   $$h(x) = (f(x) + g(x))^2$$

   compute $h'(1)$.

   (b) Find all values α such that $f'(0) = -3$ where $f(x) = \arcsin(\alpha x)$.

2. Each part of this question is worth 2 marks. **You have to show all your work in order to get credit.**

(a) **(2pt)** Let $f(x)$ be a differentiable function such that $f(1) = 4$ and $f'(1) = 4$. Evaluate the limit by identifying it as a derivative

$$\lim_{x \to 1} \frac{x\sqrt{f(x)} - 2}{x - 1}$$

(b) **(2pt)** Given the equation

$$\sin(xy) + \arccos(y) - \frac{\pi}{2} = 2y + x^2 - 1$$

compute $\dfrac{dy}{dx}$ at the point $(x, y) = (1, 0)$.

3. This question is worth 4 marks. **You have to show all your work in order to get credit.**

Find the equation of the tangent line to the graph

$$y = \frac{(1+x)^{x^2}}{2x^x}$$

at the point $(x, y) = (1, 1)$.