Name ____

Math 226.05 HW Quiz III

1. Find the **slope of the tangent line** to the graph of the function below at the point (2,4) by taking the limit of the slopes of secant lines. Then find the **equation of the tangent line**.

$$y = f(x) = x^2$$

Solution: m = $\lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = \lim_{h\to 0} \frac{(2+h)^2-2^\wedge 2}{h} = \lim_{h\to 0} \frac{4+4h+h^2-4}{h} = \lim_{h\to 0} \frac{4h+h^2}{h} =$

$\lim_{h\to 0} 4 + h = 4$

y -4 = 4(x-2) then y = 4x-4

2. Find the limit

$$\lim_{h\to 0} \frac{\sqrt{2h+1}-1}{h}$$

Solution:

$$\lim_{h\to 0} \frac{\sqrt{2h+1}-1}{h} = \lim_{h\to 0} \frac{(\sqrt{2h+1}-1)}{h} \frac{(\sqrt{2h+1}+1)}{(\sqrt{2h+1}+1)} = \lim_{h\to 0} \frac{2h+1-1}{h(\sqrt{2h+1}+1)}$$

$$= \lim_{h\to 0} \frac{2h}{h(\sqrt{2h+1}+1)} = \lim_{h\to 0} \frac{2}{(\sqrt{2h+1}+1)} = \lim_{h\to 0} \frac{2}{2} = 1$$

Name ____

Math 226.05 Quiz VII

1. Find the derivative of the function below.

$$f(x) = x^3\sqrt{x+1} - \ tan2x$$

Solution: $f'(x) = 3x^2\sqrt{x+1} + x^3 * \frac{1}{2}(x+1)^{-\frac{1}{2}} - 2\sec^2 2x$

$$= 3x^2\sqrt{x+1} + \frac{x^3}{2\sqrt{x+1}} - 2\sec^2 2x$$

2. Find the **y-intercept, zeros** (if any), **vertical asymptotes** (if any), and **horizontal asymptotes** (if any) of the function below. Then perform a **sign analysis** and **graph the function**.

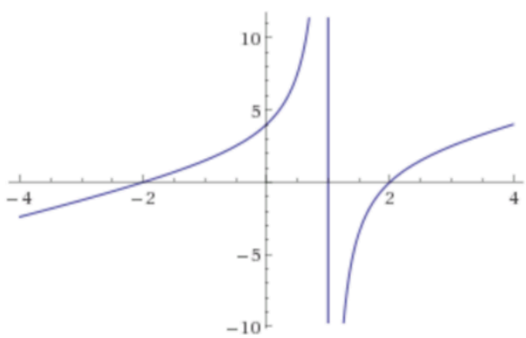
$$f(x) = \frac{x^2-4}{x-1} = \frac{(x-2)(x+2)}{x-1}$$

Solution: y-intercept: x = 0, y = --4/-1 = 4
Zeros: x = 2 and -2
Vertical asymptote: x = [illegible]
Horizontal : [illegible] asymptote

Sign analysis:

- 0 | - 0 +

[illegible]/- -2 -+/- 1 -+/+ 2 ++/+



Name ____

Math 226 Spring 2017 Midterm I 3/10/17

1. Use the **definition of the derivative** (in terms of *f(a+h)* and *f(a)*) to find the derivative of the function below at the point (4,2).

$$f(x) = \sqrt{x}$$

Solution: $\lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = \lim_{h\to 0} \frac{\sqrt{4+h}-\sqrt{4}}{h} = \lim_{h\to 0} \frac{\sqrt{4+h}-\sqrt{4}}{h} * \frac{\sqrt{4+h}+\sqrt{4}}{\sqrt{4+h}+\sqrt{4}} =$

$$\lim_{h\to 0} \frac{4+h-4}{h(\sqrt{4+h}+\sqrt{4})} = \lim_{h\to 0} \frac{h}{h(\sqrt{4+h}+\sqrt{4})} = \lim_{h\to 0} \frac{1}{(\sqrt{4+h}+\sqrt{4})} = \frac{1}{(\sqrt{4}+\sqrt{4})} = \frac{1}{4}$$

For problems 2 – 3, find the derivative, *f'(x)*, for each function.

2. $f(x) = x^3\sqrt{x+1} - \tan 2x$

Solution: $f'(x) = 3x^2\sqrt{x+1} + x^3 \cdot \frac{1}{2}(x+1)^{-\frac{1}{2}} - 2\sec^2 2x$

$$= 3x^2\sqrt{x+1} + \frac{x^3}{2\sqrt{x+1}} - 2\sec^2 2x$$

3. $f(x) = \frac{x^2+3x+1}{3^x}$

Solution: $f'(x) = \frac{(2x+3)\, 3^x - \ln 3\; 3^x(x^2+3x+1)}{(3^x)^2} = \frac{2x+3-\ln 3\,(x^2+3x+1)}{3^x}$