MATHEMATICS 180

NAME_____

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TOTAL_____

1.(*20 pts.*) Let $f(x) = \frac{2}{x^2+1}$. Consider the point $P = (1, 1)$ on the graph of $f(x)$.

a) Find the equation of the line L tangent to $f(x)$ at P.

b) Find points on the graph of $f(x) = x^3/3 + 1$ at which the tangent line has slope $m = 1$.

2. (*20 pts.*) Using the power rule, quotient rule, and chain rule compute the derivatives of the following functions:

a) $y(x) = \sqrt{x+1} - \frac{2}{\sqrt{x+1}}$,

b) $y(x) = \sqrt[7]{x^{10}} + \frac{x^2}{x^5} - \frac{x}{3}$,

c) $y(x) = (x^2+2)^{11}$,

d) $y(x) = (3x^2+x)(2x+1)^2$,

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

3.(*20 pts.*) Let $f(x) = x^3 + x$.

a) Compute $f(x+h) - f(x)$,

b) Compute the difference quotient $\frac{f(x+h)-f(x)}{h}$ and simplify,

c) Compute the limit in b) when $h \to 0$, that is $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$.

4.(*20 pts.*) Evaluate the following limits

a)

$$\lim_{x \to 2} \frac{x^3 - 1}{x - 1}$$

b)

$$\lim_{x \to 1} \frac{1 - \sqrt{x}}{1 - x}$$

c)

$$\lim_{x \to -\infty} \frac{6x^7 - 5}{2x^6 + 3}$$

d)

$$\lim_{x \to -\infty} \frac{4x^3 - 8x + 11}{3x - 3}$$

5.(*20 pts.*) A company determines that monthly sales S, in thousands, after t months of marketing a product is given by

$$S(t) = 2t^3 - 40t^2 + 220t + 160.$$

a) Find the monthly sales after 1 month and 4 month.

b) Find the rate of change $S'(t)$.

c) Find the rate of change $t = 1$ and $t = 4$.