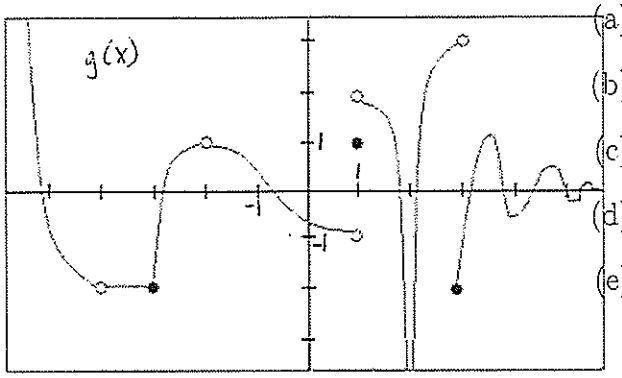
Math 105 Quiz 3
§2.1-§2.3.
Name: Key
Show all work for credit. As discussed in class, please re-write any negative or fractional exponents appropriately.

1. Determine the following limits using the graph of $g(x)$.



(a) $\lim_{x\to -2} g(x) = 1$
(b) $\lim_{x\to 1^+} g(x) = 2$
(c) $\lim_{x\to 3^-} g(x) = 3$
(d) $\lim_{x\to -4} g(x) = -2$
(e) $\lim_{x\to 1} g(x) =$ DNE

2. Find the derivative of $f(x) = \frac{2}{x+3}$ using the limit definition of the derivative.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{\frac{2}{x+h+3} - \frac{2}{x+3}}{h} = \lim_{h\to 0} \frac{\frac{2(x+3)}{(x+h+3)(x+3)} - \frac{2(x+h+3)}{(x+h+3)(x+3)}}{h}$$

$$= \lim_{h\to 0} \frac{\frac{2(x+3)-2(x+h+3)}{(x+h+3)(x+3)}}{h} = \lim_{h\to 0} \frac{2x+6-2x-2h-6}{(x+h+3)(x+3)} = \lim_{h\to 0} \frac{-2h}{(x+h+3)(x+3)h}$$

$$= \lim_{h\to 0} \frac{-2}{(x+h+3)(x+3)} = \frac{-2}{(x+3)^2}$$

3. Use the sum/difference, constant multiple, and power rules to evaluate the following.

(a) $f(x) = 2\sqrt[5]{x^2} + \frac{2}{5x^2} - \frac{x}{4} + x^{3/5}$. Find $f'(x)$.

$$f(x) = 2x^{2/5} + \frac{2}{5}x^{-2} - \frac{1}{4}x + x^{3/5}$$

$$f'(x) = \frac{4}{5}x^{-3/5} - \frac{4}{5}x^{-3} - \frac{1}{4} + \frac{3}{5}x^{-2/5} = \frac{4}{5\sqrt[5]{x^3}} - \frac{4}{5x^3} - \frac{1}{4} + \frac{3}{5\sqrt[5]{x^2}}$$

(b) Find the equation of the tangent line at $x = 4$ for $f(x) = 3x^2 + 4x - 1$.

$f'(x) = 6x + 4$ $\qquad$ $f(4) = 3(4)^2 + 4(4) - 1$
$f'(4) = 28$ $\qquad$ $= 48 + 16 - 1 = 63$

$$y - 63 = 28(x-4)$$
$$y = 28x - 49$$