Math 176 Midterm Practice Version A

1. The equation of the line passing through the points $(1, 0)$ and $(2, 3)$ may be written in the form $ax + by = 1$ where

$a =$ [ ] and $b =$ [ ]

2. Suppose $f(x) = 2x + 1$ and $g(x) = x^2$. Evaluate the composition

$$(f \circ g)(2) = \boxed{}$$

3. Evaluate the following limits:

$\lim_{x \to 4} \sqrt{5 + x} =$ [ ] and $\lim_{x \to 3} \frac{x^2 - 9}{x - 3} =$ [ ]

4. Under a set of controlled laboratory conditions, the size of the population P of a certain bacteria culture at time t in minutes is described by $P(t) = 3t^3 + 2t + 1$. The rate of population growth at $t = 19$ minutes is

[ ] bacteria per minute.

5. Find the following derivatives:

$\frac{d}{dx}\left(2x^3 + 1\right) =$ [ ] $\qquad \frac{d}{dx}\sqrt{3 + x^2} =$ [ ]

$\frac{d}{dx}\left[(x + 1)^{1/2}(x + 3)^{1/3}\right] =$ [ ]

6. The quotient rule is

(A) $\left(\frac{f}{g}\right)'(x) = \frac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$

(B) $\left(\frac{f}{g}\right)'(x) = \frac{g'(x)f(x) - g(x)f'(x)}{g(x)^2}$

(C) $\left(\frac{f}{g}\right)'(x) = \frac{f'(x)g(x) - f(x)g'(x)}{f(x)^2}$

(D) $\left(\frac{f}{g}\right)'(x) = \frac{g'(x)f(x) - g(x)f'(x)}{f(x)^2}$

(E) none of these.

7. For the demand equation

$$x = -\frac{5}{4}p + 20$$

compute the elasticity of demand $E(p)$ and determine whether the demand is elastic, unitary or inelastic when $p = 10$.

$E(p) =$ ☐ $E(10) =$ ☐

The demand is

(A) elastic

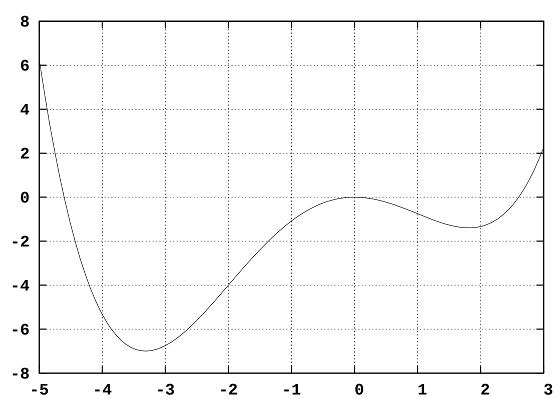
(B) unitary

(C) inelastic

8. List all critical values for the function $f(x) = x^2/(x+1)$.

$x =$ ☐

9. Consider the function $y = f(x)$ given by the following graph:



(True/False) The function has a relative maximum at $x = 0$.

(True/False) The function has an inflection point at $x = 2$.

(True/False) The function is concave down on the interval $[-2, 1]$.

10. Find the absolute maximum and absolute minimum values of $g(x) = x^2 + 2x + 3$ on the interval $[-3, 5]$.

absolute maximum = ☐ absolute minimum = ☐

11. Use the limit definition of derivative

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

to explain why the derivative of $f(x) = \sqrt{x}$ is $f'(x) = \dfrac{1}{2\sqrt{x}}$.

12. Explain the reciprocal rule $(1/g)'(x) = -g'(x)/g(x)^2$ using limits.

13. Find the equation of the line tangent to $y^3 - y = x^2 + xy - 1$ at the point $(1, \sqrt{2})$.