MTH 162
Exam 2
Spring 2017

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

A graphing calculator is allowed (e.g., TI-84). No calculator with a Computer Algebra System (CAS) is allowed (e.g., TI-89, TI-Nspire).

1. (8 pts.) $3000 is invested for 8 months at an annual simple interest rate of 9%.

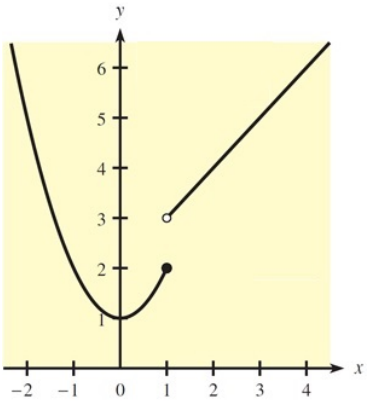
(a) How much interest will be earned?

(b) What is the future value of the investment after 8 months?

2. (8 pts.) Find the future value if $6800 is invested for 7 years at 8% compounded continuously.

3. (8 pts.) Find the present value of an annuity of $11,000 paid at the end of each quarter for 5 years if the interest rate is 12%, compounded quarterly.

4. (12 pts.) This figure shows the graph of $y = f(x)$.



For each of these, find the value or state that it does not exist.

(a) $\lim_{x \to 1^-} f(x)$

(b) $\lim_{x \to 1^+} f(x)$

(c) $\lim_{x \to 1} f(x)$

(d) $f(1)$

5. (12 pts.) Let $f(x) = 6x^2 + 3x - 2$. In this problem, you will find $f'(x)$ by using the definition of derivative. The five steps are outlined for you. For parts (a) through (e), simplify the given expression.

(a) $f(x+h) =$

(b) $f(x) =$

(c) $f(x+h) - f(x) =$

(d) $\dfrac{f(x+h) - f(x)}{h} =$

(e) $f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h} =$

6. (8 pts.) Use algebraic methods to find the limit, if it exists.

$$\lim_{x \to 5} \frac{x^2 - 2x - 15}{x^2 - 7x + 10}$$

7. (8 pts.) Find the derivative, but do not simplify your answer.

$y = (5x^2 + 2x + 1)(\sqrt{x} - 6\sqrt[3]{x})$

8. (8 pts.) Differentiate the function. Do not simplify your answer.

$y = \sqrt{x^2 + 9x + 12}$

9. (8 pts.) Find the derivative of the function. Do not simplify your answer.

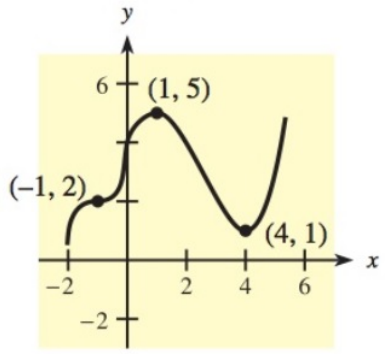
$$y = \frac{(x^3 - 5)^4}{x^3 + 2}$$

10. (8 pts.) Suppose the revenue (in dollars) from the sale of x units of a product is given by

$$R(x) = \frac{30x^2 + 34x}{5x + 2}$$

Find the marginal revenue when 9 units are sold. Interpret your result.

11. (4 pts.) This figure shows the graph of $y = f(x)$.

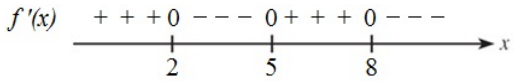


Identify at which of the three indicated points the derivative $f'(x)$

(a) changes from negative to positive,

(b) does not change sign.

12. (8 pts.) This figure shows the sign diagram for $f'(x)$.



Use the sign diagram to determine

(a) the critical values of $f(x)$,

(b) intervals on which $f(x)$ increases,

(c) x-values at which relative maxima for $f(x)$ occur,

Formula Page.

TVM App:

N = number of periods = (number of periods per year) $\cdot$ (number of years)

I% = periodic interest rate $= \dfrac{\text{nominal annual interest rate}}{\text{number of periods per year}}$

PV = present value PMT = payment FV = future value

P/Y = 1 C/Y=1 END

Simple Interest

$I = Prt, \qquad S = P + I$

Compound Interest

$n = mt, \qquad i = \dfrac{r}{m}, \qquad S = P(1+i)^n = P\left(1 + \dfrac{r}{m}\right)^{mt}, \qquad S = Pe^{rt}$

$\text{APY} = \left(1 + \dfrac{r}{m}\right)^m - 1 = (1+i)^m - 1, \qquad \text{APY} = e^r - 1$

Future Value of an Ordinary Annuity

$S = R \cdot s_{\overline{n}|\,i} = R \cdot \left[\dfrac{(1+i)^n - 1}{i}\right]$

Present Value of an Ordinary Annuity

$A_n = R \cdot a_{\overline{n}|\,i} = R \cdot \left[\dfrac{1 - (1+i)^{-n}}{i}\right]$

Amortization Formula

$R = A_n \cdot \left[\dfrac{i}{1 - (1+i)^{-n}}\right]$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \qquad y - y_1 = m(x - x_1)$

function	derivative
$y = fg$	$y' = f'g + fg'$
$y = \dfrac{f}{g}$	$y' = \dfrac{f'g - fg'}{g^2}$
$y = (\text{stuff})^n$	$y' = n(\text{stuff})^{n-1}(\text{stuff})'$