1) Find the equation of the tangent line (in slope-intercept form) to the curve of the function $f(x)=\dfrac{3x+2}{2x+3}$ at the point $(-1,-1)$.

A. $y=5x+6$
B. $y=5x+4$
C. $y=-5x-4$
D. $y=5x-4$
E. $y=-5x-6$

2) Find the derivative of the function *f* below. Evaluate $f'(2)$.

$$f(x)=(2x^2-6x+5)^4$$

A. $f'(2)=8$
B. $f'(2)=4$
C. $f'(2)=-8$
D. $f'(2)=-4$
E. $f'(x)=-16$

3) Find the derivative of function *h* below. Simplify.

$$h(x)=x^2\sqrt{9x^2+4}$$

A. $\dfrac{dh}{dx}=\dfrac{27x^3+8x}{\sqrt{9x^2+4}}$
B. $\dfrac{dh}{dx}=\dfrac{36x^3+x^2+4}{2\sqrt{9x^2+4}}$
C. $\dfrac{dh}{dx}=9x^2+4x$
D. $\dfrac{dh}{dx}=\dfrac{27x^3+8x}{3x+2}$
E. $\dfrac{dh}{dx}=\dfrac{18x^2}{\sqrt{9x^2+4}}$

4) Find the **interest** earned on $10,000 invested for 4 years at 5% interest compounded quarterly. Round to the nearest cent. (See formulas on the cover sheet.)

A. $2155.06
B. $2198.90
C. $2208.95
D. $2184.03
E. $2214.03

5) Solve the exponential equation below.

$$8^{x+2} = 32^{2x-3}$$

A. $x = 3$
B. $x = \frac{2}{3}$
C. $x = \frac{5}{2}$
D. $x = \frac{3}{2}$
E. $x = \frac{7}{2}$

6) Find the derivative of $y = \ln(x^3)$.

A. $y' = 3x$
B. $y' = 3x^2$
C. $y' = \frac{3}{x^2}$
D. $y' = \frac{3}{x}$
E. $y' = \frac{3}{x^3}$

7) Solve the equation: $\log_3(x-2) + \log_3(x+6) = 2$

A. $x = -7,\ x = 3$
B. $x = 7$
C. $x = -3,\ x = 7$
D. $x = 3$
E. No solution.

8) Let $\log_b 2 = R$ and $\log_b 5 = T$. Use the properties of logarithms to represent $\log_b 20$.

A. $R + 2T$
B. $2RT$
C. $2(R+T)$
D. $R+T$
E. $2R+T$

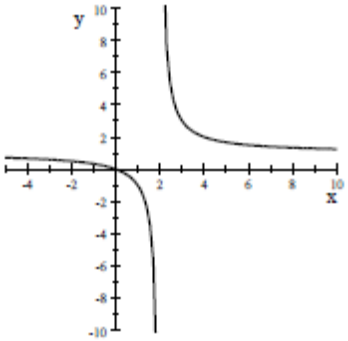
9) Find the derivative of $y = \dfrac{e^x}{2x^2+x}$. Factor where possible.

A. $\dfrac{e^x(2x^2+3x-1)}{x^2(2x+1)^2}$
B. $\dfrac{e^x(2x^2-3x-1)}{x(2x+1)}$
C. $\dfrac{e^x(2x^2-3x-1)}{x^2(2x+1)^2}$
D. $\dfrac{x^2e^x(2x^2-3x+1)}{(2x+1)^2}$
E. $\dfrac{e^x(2x^2-3x+1)}{(2x^2+x)^2}$

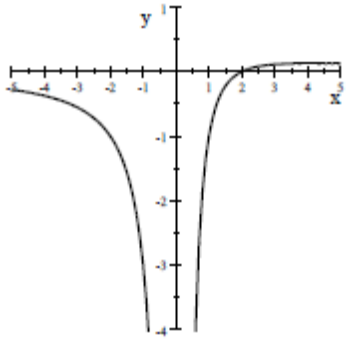
10) The function $f(x) = 4x^4 - 8x^2$ has:

A. One relative minimum and two relative maximums.
B. One relative minimum and one relative maximum.
C. Two relative maximums and no relative minimums.
D. Two relative minimums and no relative maximums.
E. Two relative minimums and one relative maximum.

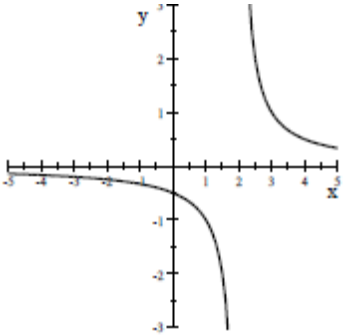
11) For the function $f(x)=\dfrac{x^2}{x-2}$; find any intercepts, intervals of increasing/decreasing, coordinates of any relative maximum or relative minimum points, values of *x* for which the graph is concave upward or downward, and any asymptote equations. Use your information to select the correct graph for function *f*.



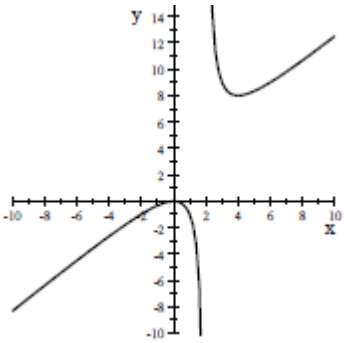
A.



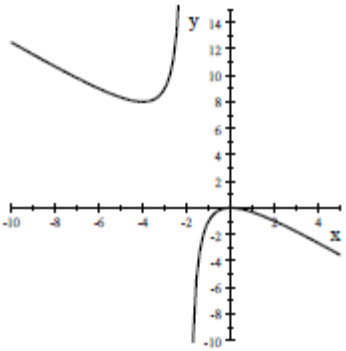
B.



C.



D.



E.

12) A certain drug is administered to a patient, with the percent of concentration of the drug in the bloodstream *t* hours later given by $K(t)=\dfrac{5t}{t^2+1}$. After **how many hours** is the concentration of drug in the bloodstream at a **maximum**?

A. $\dfrac{1}{2}$ hour

B. $\dfrac{4}{5}$ hour

C. $1\dfrac{1}{3}$ hours

D. 2 hours

E. 1 hour

13) Below is function *g* and the first derivative of *g*.
Choose an interval where the function *g* is concave <u>downward</u>?
$g(x) = -x(x-3)^2$ $g'(x) = -3(x^2 - 4x + 3)$

A. $(-\infty, 2)$
B. $(1, 3)$
C. $(2, \infty)$
D. $(3, \infty)$
E. None of the above.

14) Find the second derivative of function $f(x) = \dfrac{2x}{x+1}$.

A. $f''(x) = \dfrac{-4}{(x+1)^3}$
B. $f''(x) = \dfrac{-2}{(x+1)^3}$
C. $f''(x) = \dfrac{2}{(x+1)^2}$
D. $f''(x) = \dfrac{1}{(x+1)^3}$
E. $f''(x) = \dfrac{-1}{(x+1)^3}$

15) Find all values for *x* where the following function's graph would have <u>horizontal</u> tangent lines to the graph.

$$f(x) = \frac{4}{3}x^3 - 2x^2 - 24x + 9$$

A. $x = -1,\ 6$
B. $x = -2,\ 3$
C. $x = -6,\ 1$
D. $x = -3,\ 2$
E. None of the above.

16) Which of the following equations would be asymptotes to the graph of the rational function $g(x) = \dfrac{12x^2 + 6x}{6x^2 - 7x + 2}$?

I	$x = \frac{1}{2}$
II	$y = 2$
III	$x = -\frac{2}{3}$

A. I, II, and III
B. I and II only
C. I and III only
D. II and III only
E. II only

17) Using data from a car magazine, a company constructed a mathematical model to represent the percent of cars *P* of a certain type still on the road after *t* years. This model was the following where *P* is a percent and *t* is the number of years the car has been 'on the road'.

$P = 100e^{-0.035t}$

Approximate the number of these types of cars on the road after 5 years. Round to the nearest whole number.

A. 80 cars
B. 76 cars
C. 63 cars
D. 72 cars
E. 84 cars