

10. [10 points] For each of the questions below, circle all correct choices. If none of the choices are correct, circle NONE OF THESE.

You are not required to show your work on this page.

- a. [2 points] Which of the following equations gives the tangent line to  $y = \ln(3x + 4) + 1$  at  $x = -1$ ? Circle all such equations.

i.  $y = x + 2$

iii.  $y = 3x + 4$

v.  $y = x + 4$

ii.  $y = \frac{3}{3x + 4} + 1$

iv.  $y = 1$

vi. NONE OF THESE

- b. [2 points] Which of the following functions are antiderivatives of  $f(x) = \cos(x)$ ? Circle all such functions.

i.  $\frac{1}{2}(\cos(x))^2$

iii.  $\cos\left(x - \frac{\pi}{2}\right)$

v.  $19 - \sin(x)$

ii.  $\sin(x) + 5$

iv.  $\ln\left(3e^{\sin(x)}\right)$

vi. NONE OF THESE

- c. [2 points] Which of the following limits equal 0? Circle all such expressions.

i.  $\lim_{x \rightarrow \infty} \frac{e^x}{x}$

iv.  $\lim_{x \rightarrow \infty} \frac{x^3 - 24x^2 + 188x - 480}{x^2 - 12x + 20}$

ii.  $\lim_{x \rightarrow \infty} \frac{e^{-x}}{x}$

v.  $\lim_{x \rightarrow \infty} \frac{10000}{x^{1/1001}}$

iii.  $\lim_{x \rightarrow \infty} \sin(x)$

vi. NONE OF THESE

- d. [2 points] For  $K$  a positive constant, which of the following limits equal  $K$ ? Circle all such expressions.

i.  $\lim_{h \rightarrow 0} \frac{K(1+h)^2 - K(1)^2}{h}$

iv.  $\lim_{h \rightarrow 0} \frac{e^{\ln(K)+h} - e^{\ln(K)}}{h}$

ii.  $\lim_{h \rightarrow 0} \frac{K \cos(h + 2\pi) - K \cos(2\pi)}{h}$

v.  $\lim_{h \rightarrow 0} \frac{(1+h)^K - (1)^K}{h}$

iii.  $\lim_{h \rightarrow 0} \frac{K \sin(h + 2\pi) - K \sin(2\pi)}{h}$

vi. NONE OF THESE

- e. [2 points] For constants  $A$  and  $B$ , consider the function  $h$  defined by

$$h(t) = \begin{cases} (At)^2 - 48 & \text{if } t < 2 \\ Bt^3 & \text{if } t \geq 2. \end{cases}$$

Circle all pairs of values of  $A$  and  $B$  such that  $h(t)$  is differentiable.

i.  $A = 3, B = 3$

iii.  $A = -6, B = 12$

v.  $A = 18, B = 12$

ii.  $A = 6, B = 12$

iv.  $A = 0, B = 0$

vi. NONE OF THESE